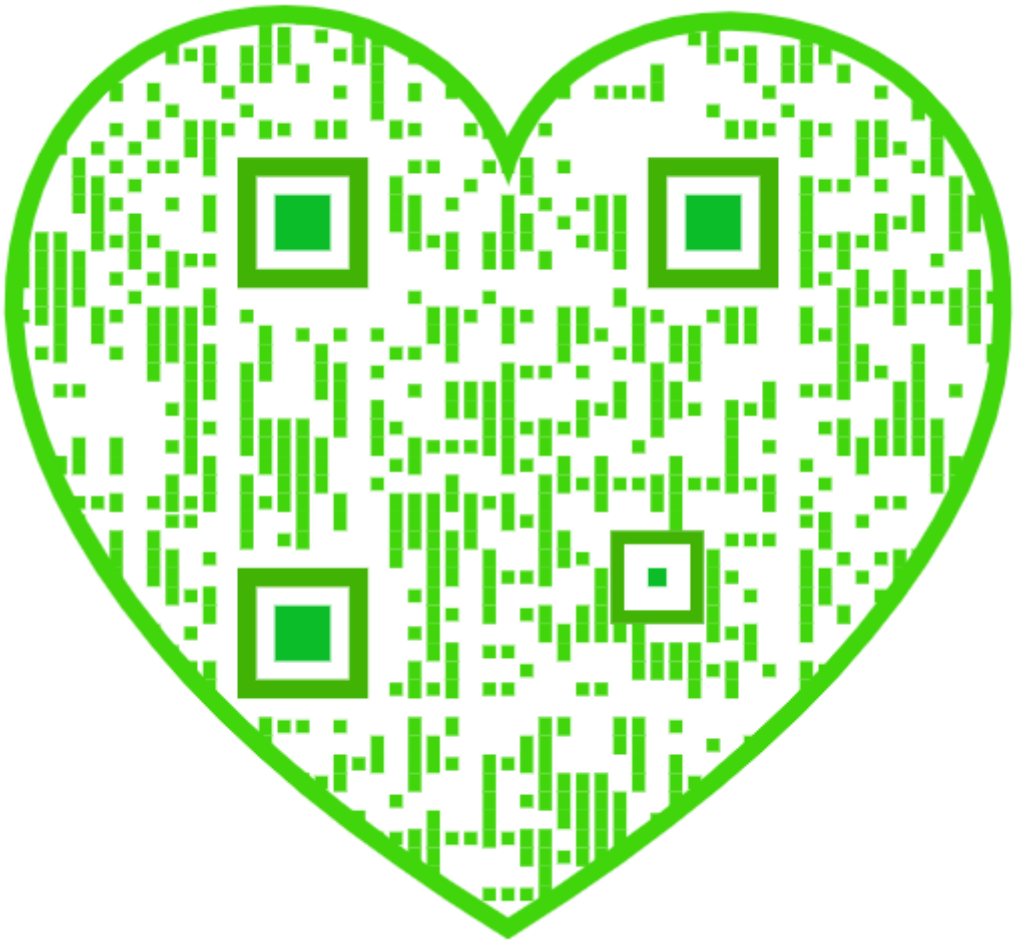
# MANUSCRIPT NOTES
ON
# WEAVING
BY
JAMES HOLMES, M.S.A.
SECOND YEAR.



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# SECOND · YEAR · WEAVING.

· BY James Holmes.·

In the making of Dobby patterns it is very desirable to enquire into the origin of the pattern, as the pattern can then be more easily understood. Further, in dealing with a set of healds, it is a desirable to thoroughly understand the drafting of the ends so as to be able to produce the greatest possible number of patterns from the warp, when drawn through the healds in any particular manner.

In dissecting a piece of cloth, the whole of the particulars ought to be put down on design paper, as shown in Fig. 1 which is the design for a 5 shaft Honeycomb cloth; these records are often useful for future reference. A Designer well skilled in his work, will take a piece of cloth, and after an examination of the same, will proceed to put down the looming and peg plan, the same as shown in Fig. 3. Complete the pattern Fig. 3 from the looming and peg plan given. Very often when only a portion of a pattern is given, the same can be completed. Fig. 4 is an incomplete pattern, repeating on 32 ends and 32 picks looming point draft; complete the pattern. Fig. 5 is incomplete, it can be woven on 20 shafts, point draft looming, and will repeat on 38 ends and 38 picks; complete the pattern. Small spot figures are often arranged in alternate order, and surrounded with a plain, satin or twill weave as in Fig. 3; in this connection take Fig. 6 and arrange it in alternate order on the space Fig 9. Fill in plain ground. arrange Fig. 8 in alternate order on space Fig. 9.

From Sketch Fig 10 make a spot, and arrange in alternate order on space Fig. 11

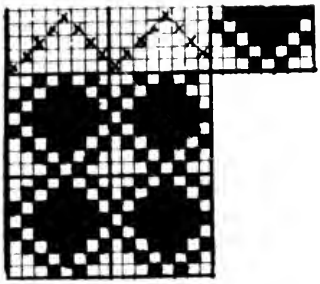


Fig. 1

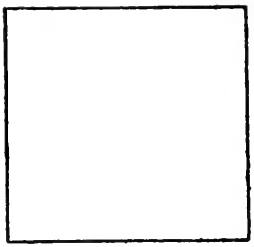


Fig. 2

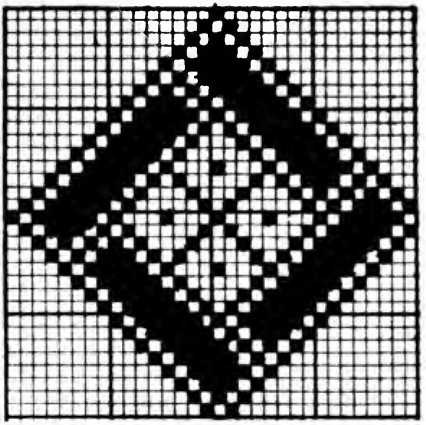


Fig. 4

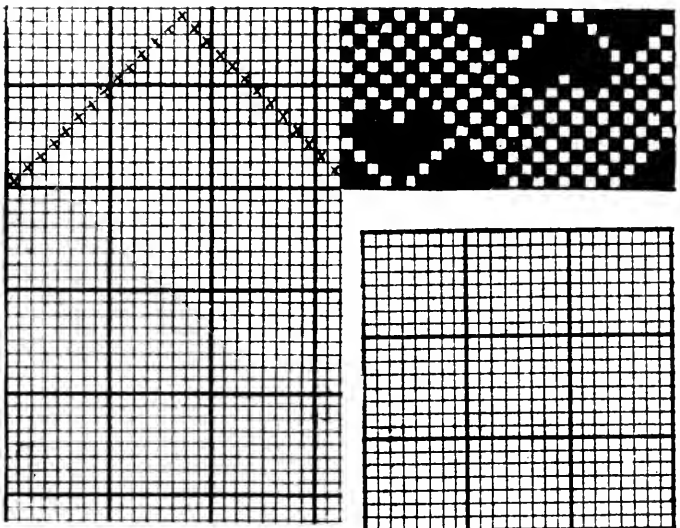


Fig. 3



Fig. 9

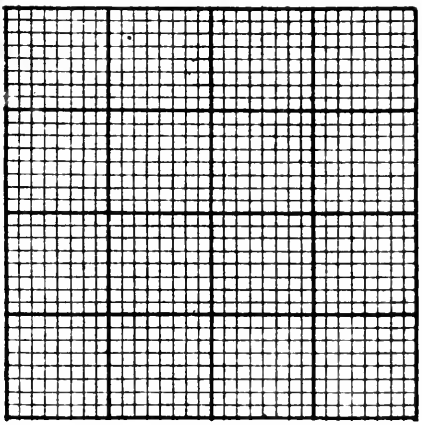


Fig. 7

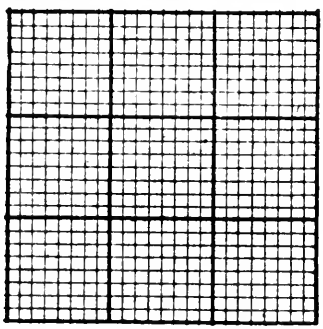


Fig. 11

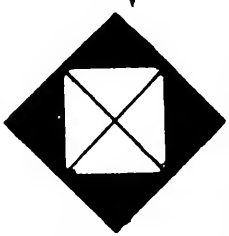


Fig. 8

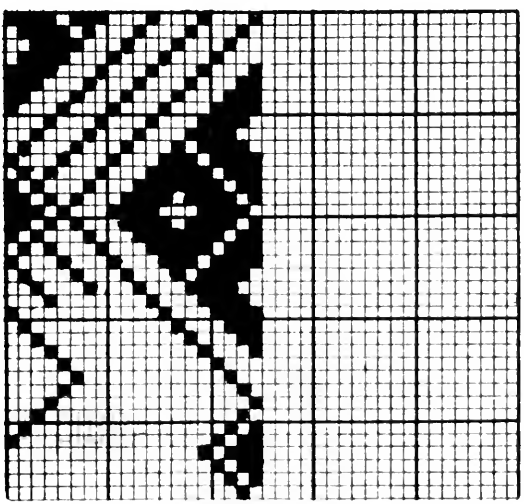


Fig. 5

Fig. 10

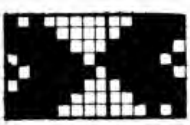


Fig. 6

ARRANGEMENT OF SPOTS IN SATIN ORDER.

Patterns are often made by arranging a number of small spots in satin order, and using a plain, twill or satin ground weave. In Fig. 12 a small spot is given, it is intended to arrange these spots in 5 end satin order on the space Fig. 13; for that purpose it is divided into 5×5 squares, each square containing 4×4 smaller squares; in the top right hand corner of each square is placed an x; assuming the x's to be always in the same part of the figure, the spots are then placed in position as shown in Fig. 13. Take the spot figure 14 and arrange it in 8 end satin order on the space Fig. 15; let the x in the centre of Fig. 14 occupy a similar position in Fig. 15. Arrange the spot Fig. 16 in 8 end satin order on the space Fig. 17; this is done by dividing the space into squares of 6×6, and placing in the top right hand corner of each one a x, the x's to be placed in the squares in the order of an 8 end satin, namely, 1. 4. 7. 2. 5. 8. 3. 6; then place the spots in position, so that the x's in Fig. 17 occupy the centre position of the figure each time. Arrange the spot Fig. 18 on the space Fig. 19 in 4 end satin order. Arrange spot Fig. 20 on the space Fig. 20a in 5 end satin order.

To find the maximum size of figure to use when a number of them are arranged in satin order. Take for example the space 30 with 5 spots to be arranged in satin order; the number of small squares in the space 30×30 = 900, and 900 ÷ 5 spots = 180 small squares for each spot, the square root of 180 = 13 and a fraction, the maximum size of spot is therefore one that will stand on a space of 13×13 this will allow no space for ground, a smaller spot is therefore used.

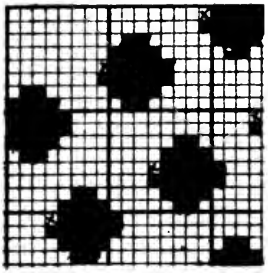


Fig. 13

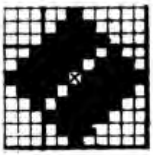


Fig. 14

Fig. 12

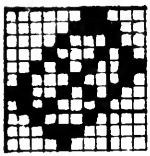


Fig 16

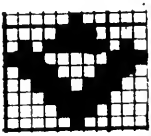


Fig. 18

Fig. 20

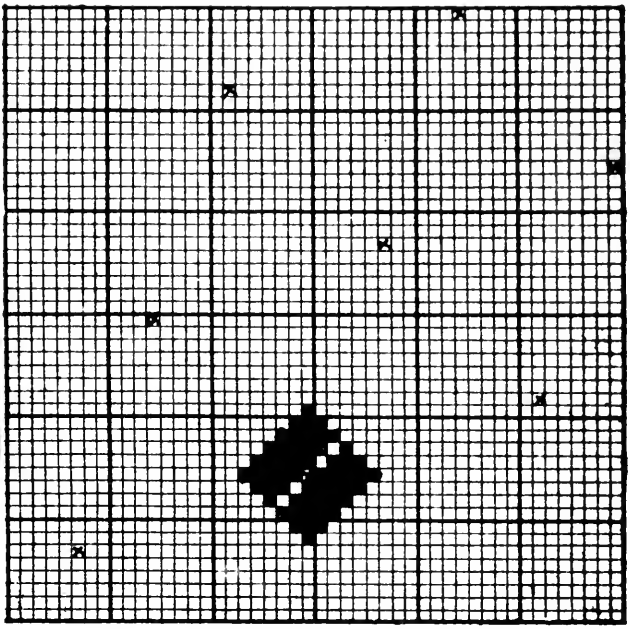


Fig. 15

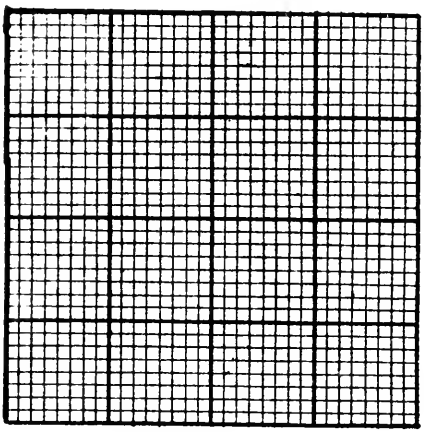


Fig. 19

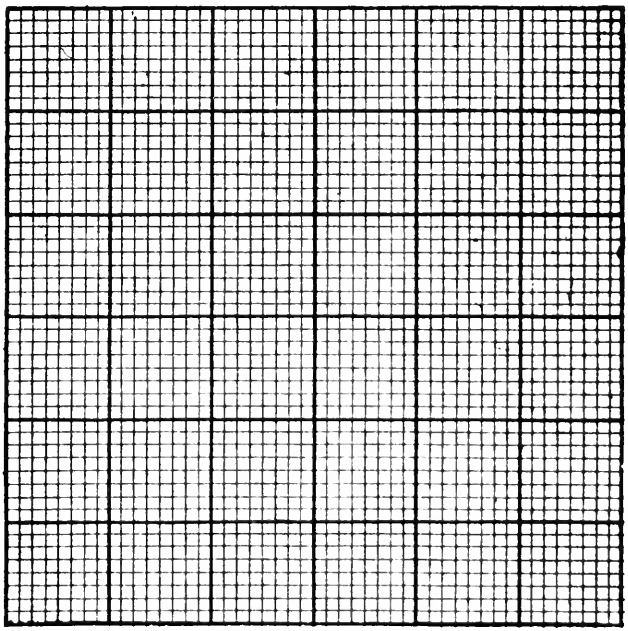


Fig. 17

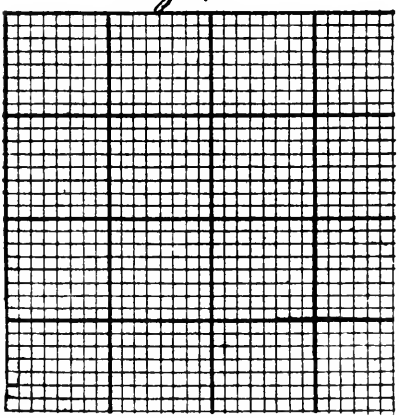


Fig 20a

WARP AND WEFT BACKED CLOTHS.

Fabrics are sometimes backed with warp or weft, a seperate weave being used for face, and a seperate weave for the back; the object of this arrangement is to make the cloth reversible, as in the case of heavy Tapestry hangings; or for the purpose of serving as a lining, or a foundation upon which another cloth can be made, as in Trouserings, Vestings, Piques, Fustians and Velvets. Bedford cords may also be included. Fig. 23 gives a pattern for a weft faced satin cloth, backed with a weft satin back; Fig. 21 gives the face and Fig. 22 the back weaves; in placing the pattern on design paper, the face weave is placed on alternate picks, the intervening picks are afterwards filled in with the back weave.

Take Fig. 24 and place it on design paper Fig. 25 and back it with an 8 end satin. Take Fig. 26 and back it with an 8 end twill on space Fig. 27.

WARP BACKED CLOTHS are somewhat similar in construction to Weft Backed cloths, the threads being arranged end and end instead of the picks. Fig. 30 gives a warp satin face pattern, backed with a warp satin weave, Fig. 28 being the face and Fig. 29 the back weave. On the space Fig 31a place the pattern Fig. 31 and back it with an eight end twill 7×1 On the space Fig. 32a place the pattern Fig. 32 and back it with an 8 end satin. Back Fig 33 on space 33a with an 8 end satin. Back Fig 34 on space 34a with an 8 end Twill 7×1. Fig 35 gives a Bedford cord. Fig. 35a gives a Bedford cord the x's indicate "backing ends". On the space 36 put down the pattern for a Bedford cord from a sample cloth.
36a

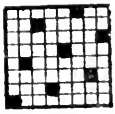
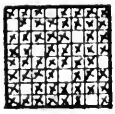


Fig. 21



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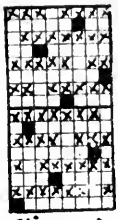


Fig. 23

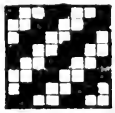


Fig. 24

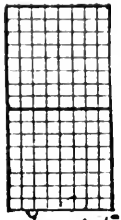


Fig. 25

Fig. 26

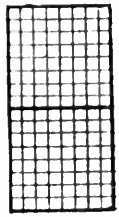


Fig. 27

Fig. 28

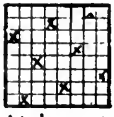
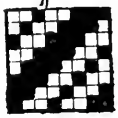


Fig. 29

Fig. 30



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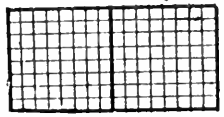


Fig. 31a

Fig. 32

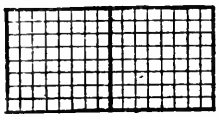


Fig. 32a

Fig. 35

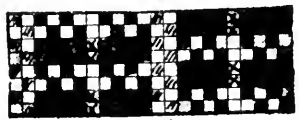


Fig. 35a

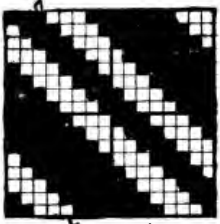


Fig. 33

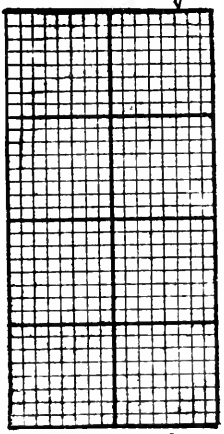


Fig. 33a

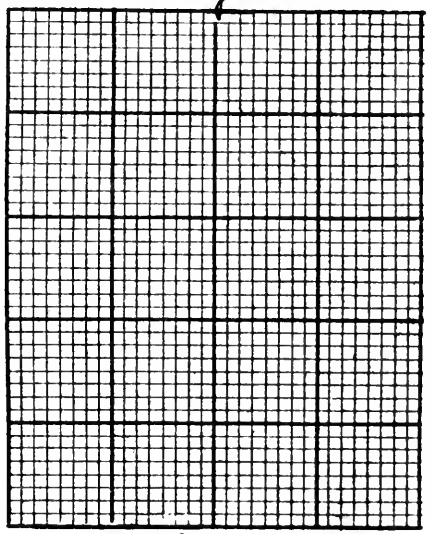


Fig. 34a

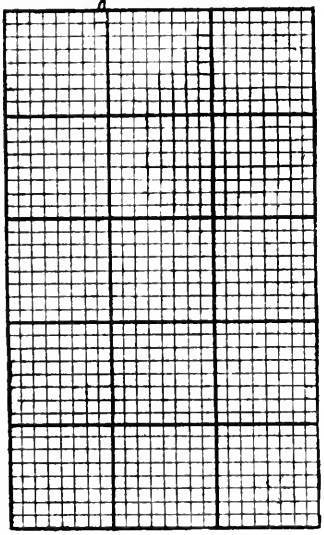


Fig. 36

BEDFORD CORD

Fig 36a

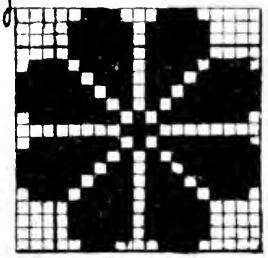


Fig. 34

FUSTIANS AND VELVETS.

The cloths are made by allowing a large quantity of weft to float on the face of the cloth, this weft is afterwards cut in the middle of each float, and gives the well known miniature brush like surface of velvets. Fustian cloths have ribs or cords running the full length of the piece, the floats of weft are cut in the middle of each rib. Fustian cloths are made into clothing for Overlookers, Weavers, and Mill operatives generally. Velvets are usually dyed and made up into velveteen suitings for boys wear. Moleskins are a heavy uncut velvet cloth, and is made into clothing for Blacksmiths, Moulders, Navvies, and ironworkers generally.
In all the above cloths, one set of picks, termed the ground picks interweave with the warp, and form the back or body of the cloth, another set of picks termed the pile picks interweave with the ends and form pile. The ground weave is either plain or twill, and 1. 2. 3. 4. or 5 pile picks are inserted for one ground pick. Fig. 37 gives a pattern for a Fustian cloth with a plain back, the ⊠s indicate the back weave and ■s the face weave. Fig. 38 is a Fustian pattern with 2 and 2 twill back. On space Fig. 39 make a Fustian with a plain back. On space Fig. 40 make a Fustian with a 2 and 1 twill back. Fig. 41 gives a velvet with a float of 5; and Fig 42 a velvet with a float of 7. On Fig. 43 make a velvet, plain back 4 pile picks 1 ground pick. On Fig. 44 make a velvet 2 and 1 twill back, 4 pile 1 ground. Fig. 45 gives a Moleskin pattern. On the space 46 put down the pattern from a Fustian (sample cloth). On the space 47 give the pattern from a Velvet (sample cloth).

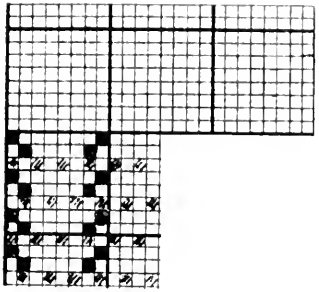


Fig. 37

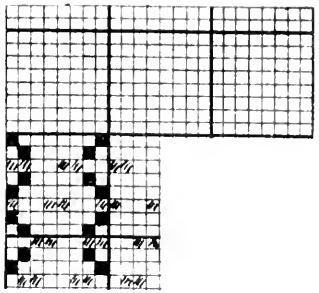


Fig. 38

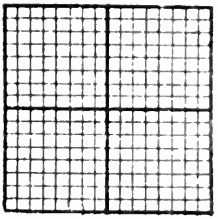


Fig. 39

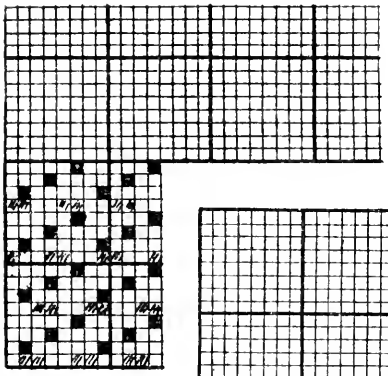
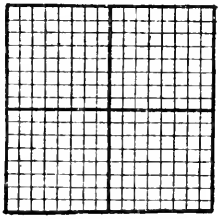


Fig. 41



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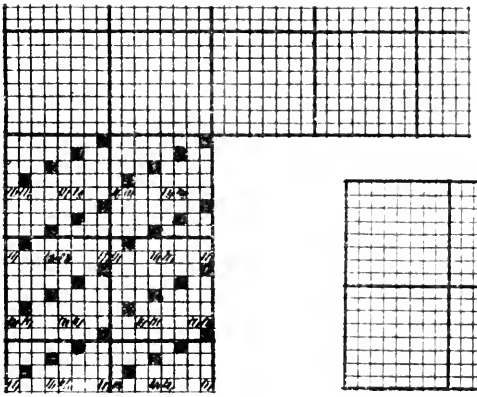


Fig. 42

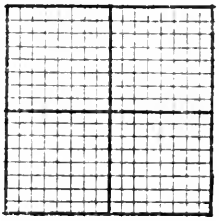


Fig. 40

PUSTIAN

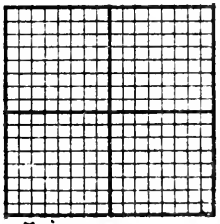


Fig. 44

VELVET

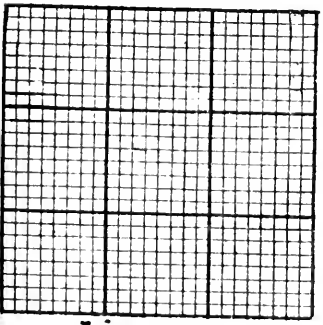


Fig. 46

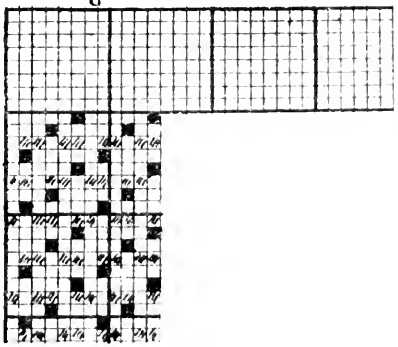


Fig. 45

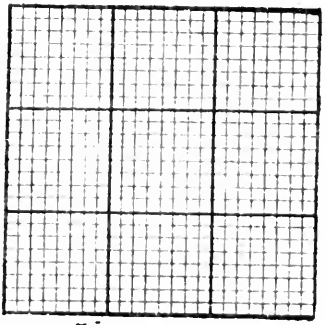


Fig. 47

Woodcroft Sectional Tappet.

In the making of Fustian and Velvet cloths, looms are provided with Woodcroft sectional Tappets or with Oscillating Tappets or some other strong positive shedding motion. Figs 37 and 38 give the front and end elevation of a Woodcroft Tappet.

The tappets are made up of sections termed "Risers" and "Sinkers". The tappets work on a stud fixed to the side of the loom, they are attached to the tappet wheel, which is driven at the required speed, from a wheel fixed on the end of the crank shaft; the risers and sinkers acting upon treadles causes them to rise and fall, this motion is communicated through cords to long levers fixed on the top and the underside of the loom, the other ends of the levers are connected to the heads and give motion to them. The working of one heads is as follows. Fig 38. B is the tappet made up of sections numbered 1 to 8, number one is a Riser and number two a "Sinker", when a riser is acting as in the sketch, the treadle C is lowered, it pulls down the cord D, likewise the end of the lever E, the other end of which is connected through the cord N to the heald L, which is therefore lifted. When a "sinker" comes into action the lever C is lifted, and through the connecting cord Y the lever W is lifted, the other end of which is connected to the heald through the cord P, pulls down the heald L.

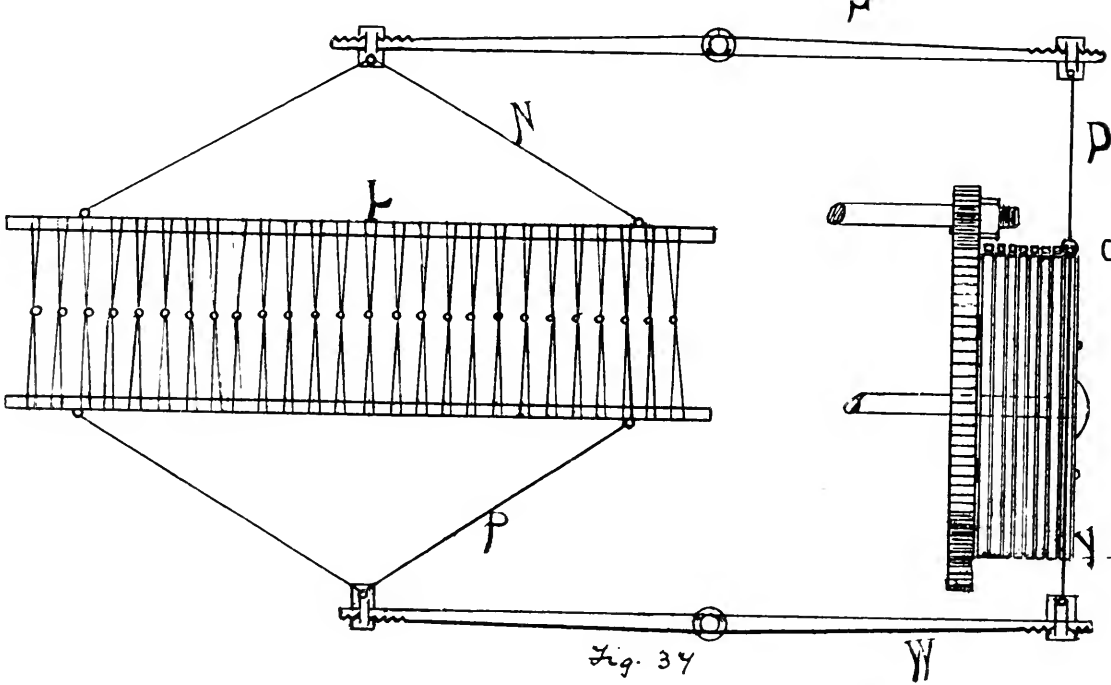



Fig. 37

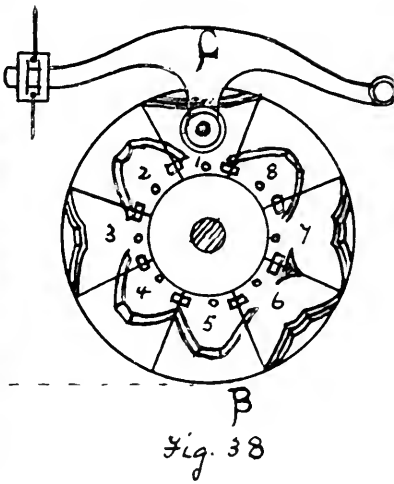



Fig. 38

# THE FUSTIAN LOOM

## Woodcroft's

Sectional Tappet and shedding Arrangement

Figure 37. Elevation of Shedding Arms.

Figure 38. Elevation of Tappet + Treadle.

These tappets are termed "positive" as they control the heards both in rising and falling; they are also centre shedding the heards coming to the middle position on each pick, and the weft is beaten up in a closed shed. These tappets are very suitable for very heavy fabrics, especially when very few changes are made in the patterns of the cloths being woven, as it takes up a considerable length of time, and is somewhat dirty work to take down and re-build a tappet.

Fig 39 gives a small design, on the circle Fig 40. build up a tappet for the 1st end of the pattern

Fig 41. gives a sample Fustian cloth, on the design paper Fig 42 make the design for the same. showing looming and peg plan.

In Fig 42a which consists of eight circles. build up a complete tappet to suit the peg plan, and to weave the sample of cloth Fig 41.

Exam. questions 1903. 3rd year. Mill Management.

Illustrate the method of construction of a Woodcroft tappet. What are the objects of the segments known as "riser dwells" and "sinker dwells" and why are they not more generally used? Compare the merits of the woodcroft tappet and the Oscillating tappet for weaving cords and velveteens.

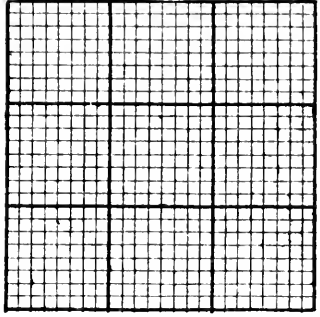


Fig 42.

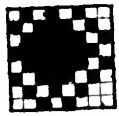


Fig. 39

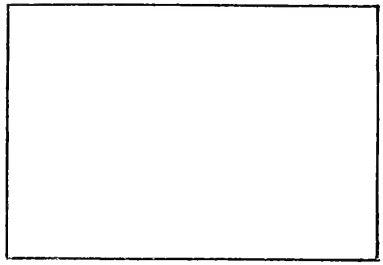


Fig 41

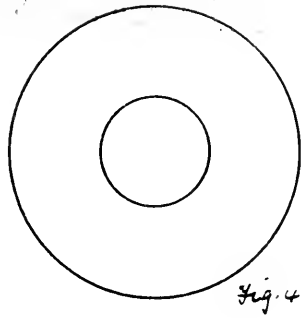
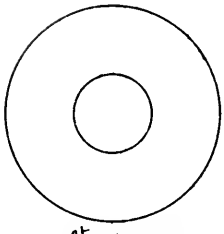
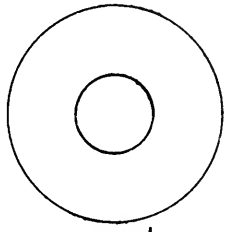


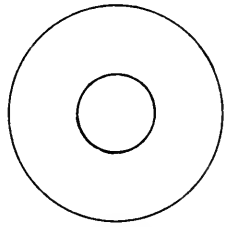
Fig. 40



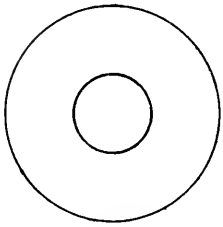
1st Heald



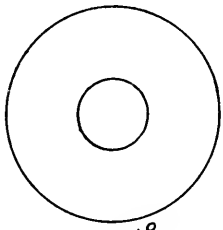
2nd



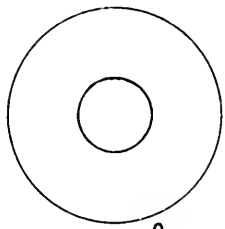
3rd



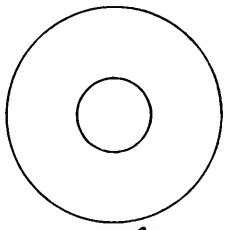
4th



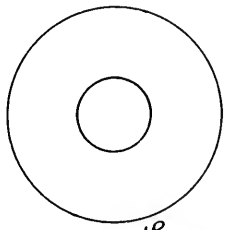
5th



6th



7th



8th

Fig. 42a

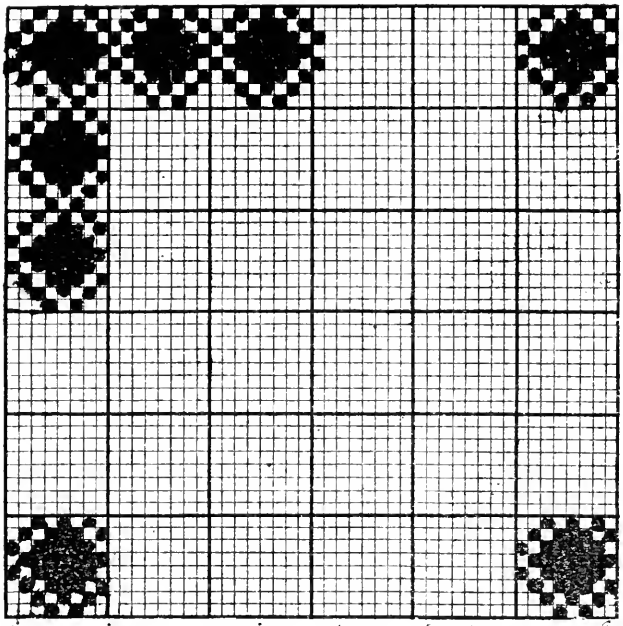


Fig. 43 gives a design for a pattern with honey-comb surrounding fill in a centre of your own designing

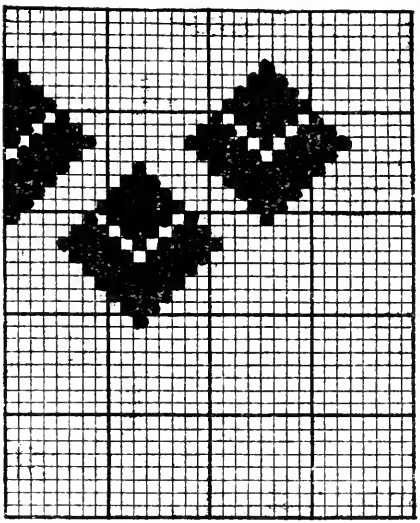
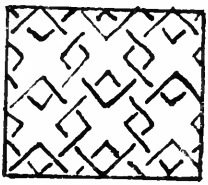


Fig 44. Fill the space with these spot figures arranged in alternate order, and surround with plain weave.



A

Mark out a design on 40 ends and 20 picks to imitate sketch A. preserve the interlacing effect, let figure be a 3 end float with a calico ground weave. This is shown in Fig 45. which requires completion

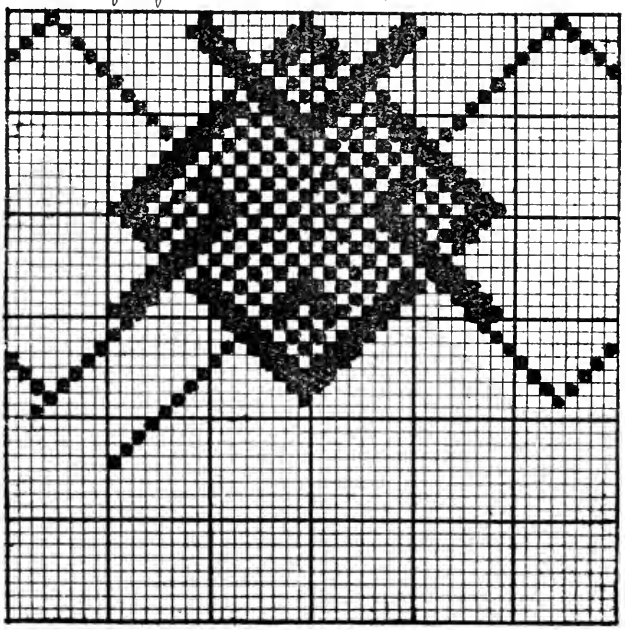


Fig. 45.

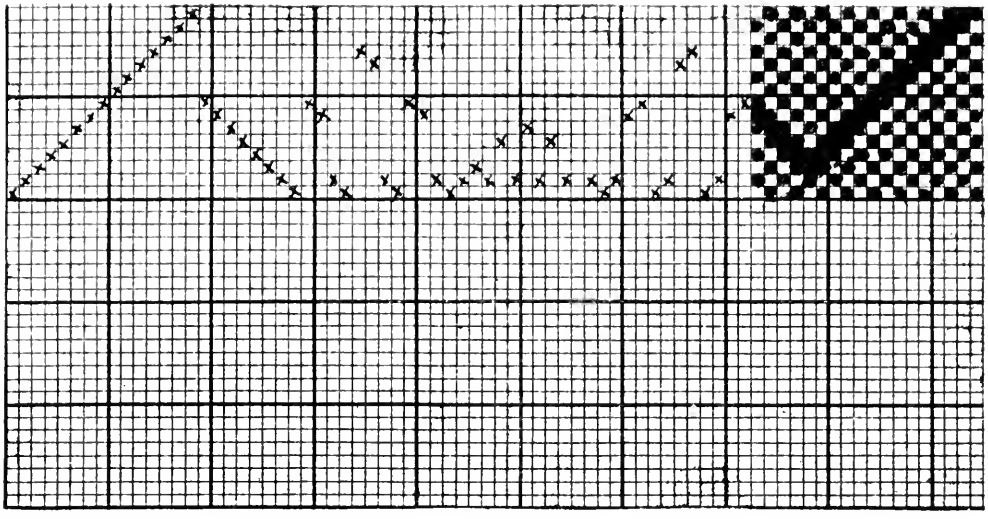


Fig 46 gives the looming and peg plan for a pattern. Fill in the design on the space below the looming. also suggest another looming for the same peg plan

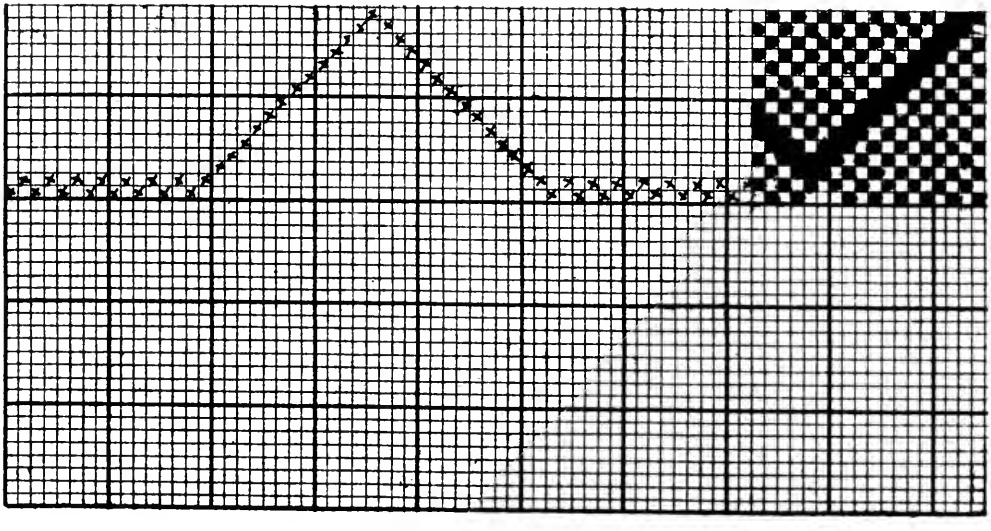
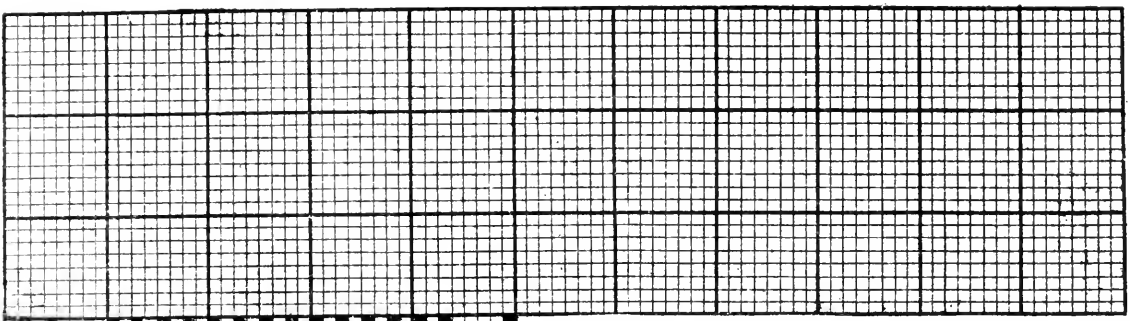


Fig 47 gives another looming as suggested in Fig 46. Complete the design from the looming and peg plan given



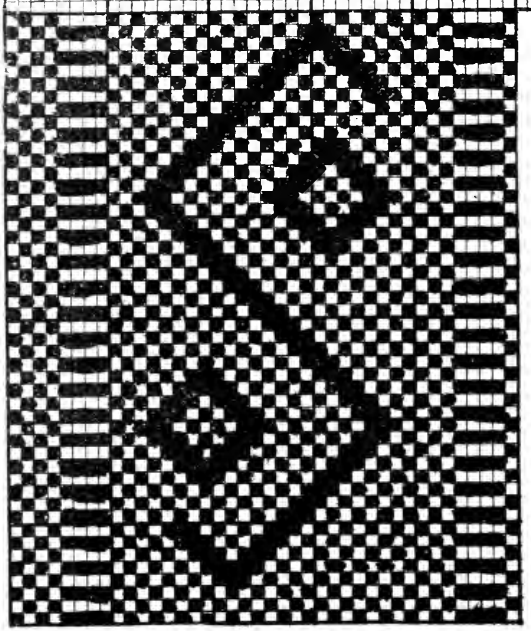


Fig. 48.

Mark out peg plan and draft for Fig 48. also give another peg plan applicable to the draft for make

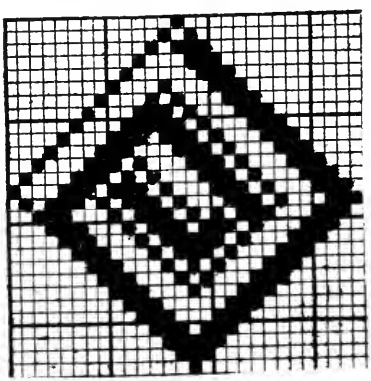


Fig. 51

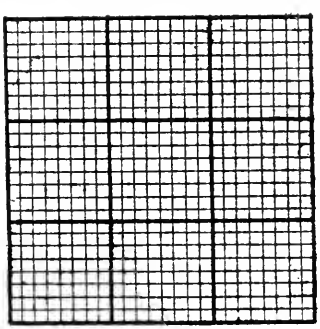


Fig 49 For Fustian cloth Design Sample.

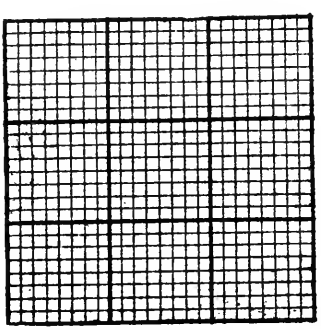


Fig 50 For Velvet cloth Design Sample

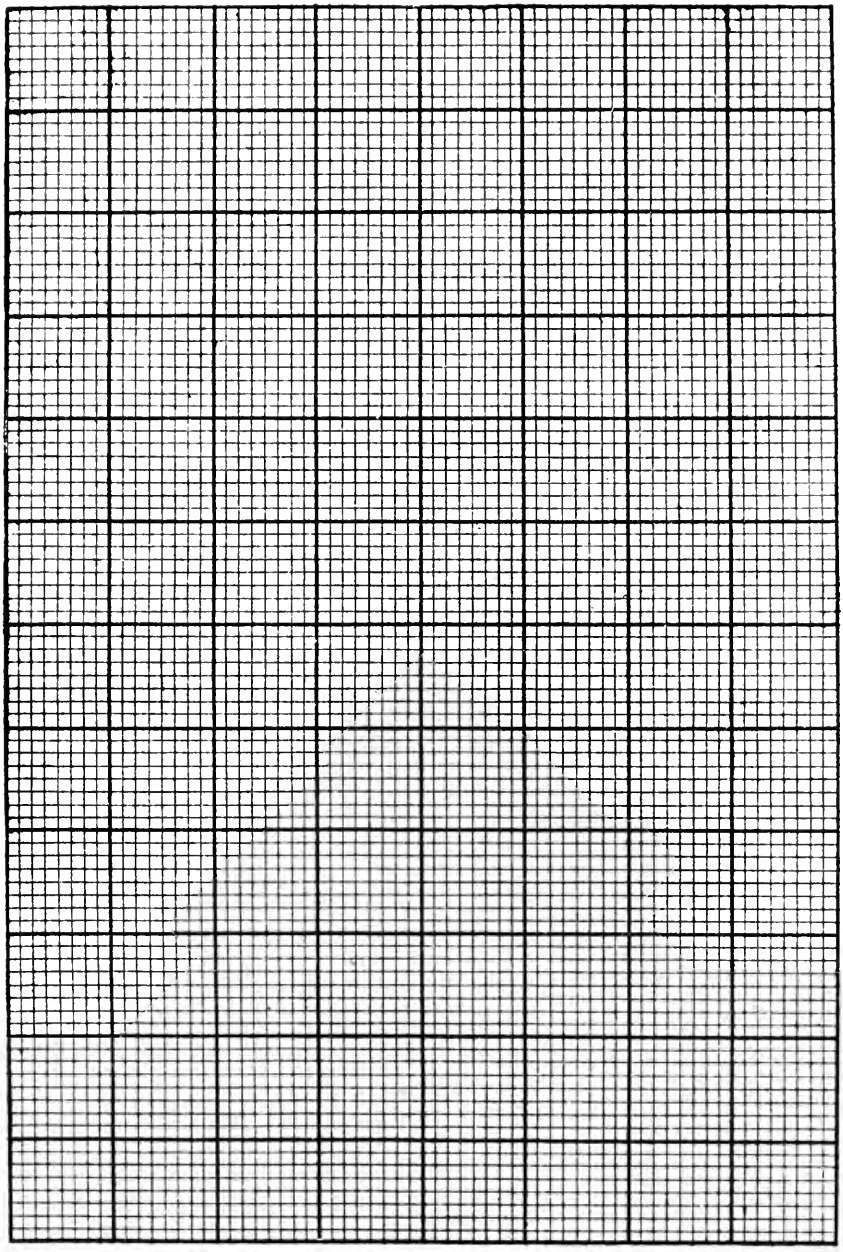


Fig 52

mark out a design on 64 ends an 96 picks (Fig 52) the ground to be calico with spots Fig. 51 arranged in 4 end satin order. You need now fill in the ground weave

SHEDDING. By means of TAPPETS.

Positive tappets are such as control the healds both in rising and falling; when they are made after the type of Fig 59 they are termed "Box plate tappets, they are fixed at the side of the loom, and operate upon treadles in a similar manner to the Woodcroft tappet; they are constructed in the same way as a "negative tappet" the only difference in the construction is that a treadle bowl $\frac{1}{8}^{th}$ of an inch larger is used, than what is required in actual practice, this allows one eight of an inch play in the space where the treadle bowl works. Fig 59 is a "Box plate tappet" of six picks to the round constructed to the following particulars:- Pattern 3 up 3 down; Nearest point of contact 1 inch; Stroke 2 inches; Treadle bowl 2 inches diameter; Dwell one third of a pick. The inner edge of the treadle bowl gives the thick line A, and the outer edges the thick line B, the space between A and B forming a groove in which the treadle bowl works.

Oscillating Tappet. This form of tappet is a useful tappet for a heavy cloth, the pattern is more readily changed than in the case of the Woodcroft tappet. In Fig. 60 the tappet is fixed at the side of the loom, and receives an oscillating motion from an arm connected with an eccentric fixed on the end of the crank shaft of the loom; A is fulcrum on which the whole tappet rocks from side to side; underneath the two levers D and E are two barrels B and C, each carrying a

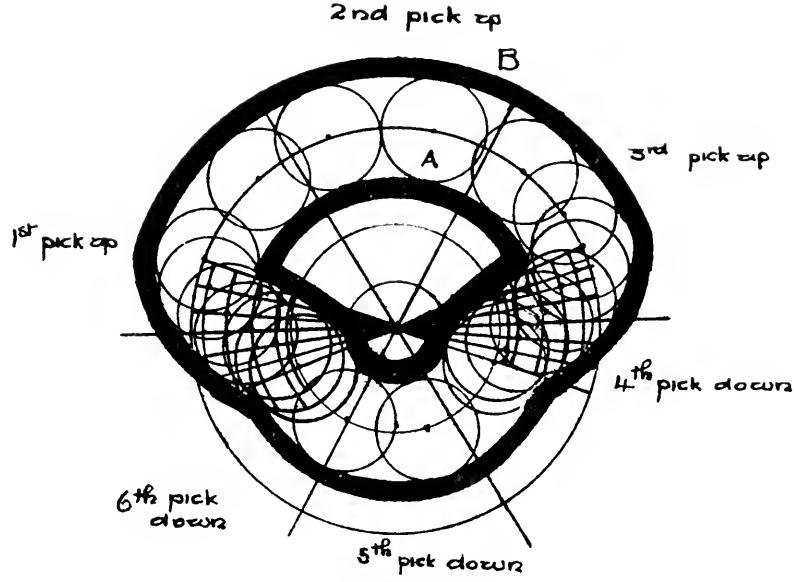

2nd pick up
B
A
3rd pick up
1st pick up
4th pick down
6th pick down
5th pick down

Fig. 59

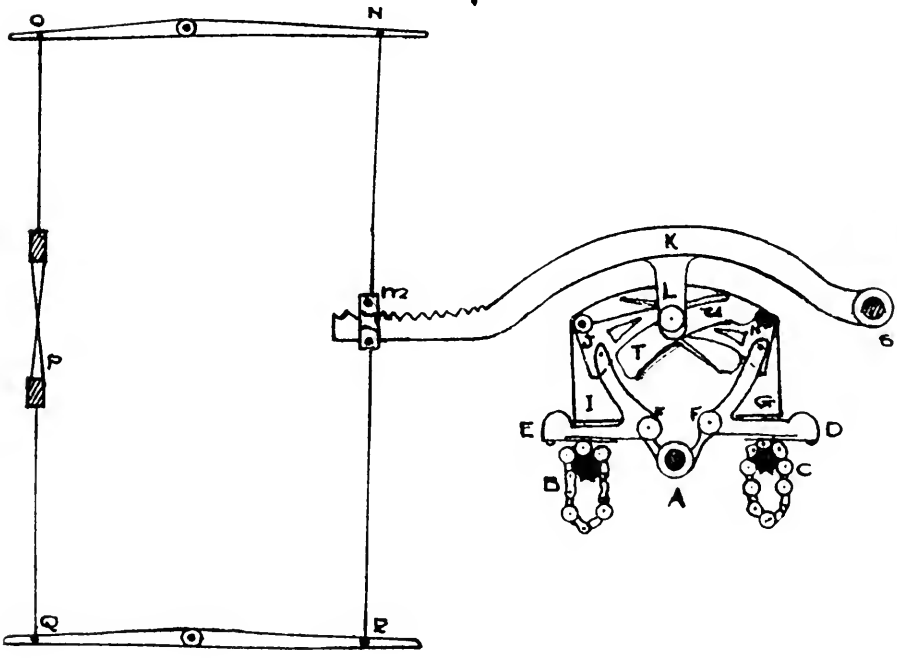

O
N
P
m2
K
L
J
T
H
G
I
F
E
D
B
A
C
Q
R

Fig. 60

Lattice made up of blanks and small bowls; D and E are connected respectively with G and I with their pulleruns at F; the end of I is connected lowly with J and the end of G in a similiar manner with H; L is a small bowl fixed to the treadle K, M is a small piece of leather fixed to the end of the treadle, and is connected through cords to the top and bottom levers N and R, the other ends of which are connected to the healds P; with all the parts set as shown in the sketch, if the tappet rocks over to the right, the treadle bowl moves down the groove T, pulling down the treadle K and lifting the heald P; or if the tappets rocks over to the left from its present position, the treadle bowl moves up the space U, lifting the treadle K and pulling down the heald P. By this means a bowl on the lattice lifts an heald and a blank lowers a heald, Barrel B serves for one pick and barrel C for the second pick.

Smalleys Tappet is illustrated in Fig. 61 It is fixed and works on the top of the loom, the tappets A are fixed to the loom top, short treadles B are arranged above them, to these the healds C are attached, the treadles are lifted by the action of the plates; the healds are afterwards drawn down by the action of the springs D. The wheels required to drive the tappet six picks to the round is shown in the sketch.

Jamiesons Tappet Fig. 62 is made up of loose plates A and is driven from the bottom shaft B through the wheel C and D.

Nuttalls Chain Tappet. Fig. 63 two barrels A.B side by side carrying a lattice of bowls and blanks act on the lever C raising and lowering it, and likewise the healds

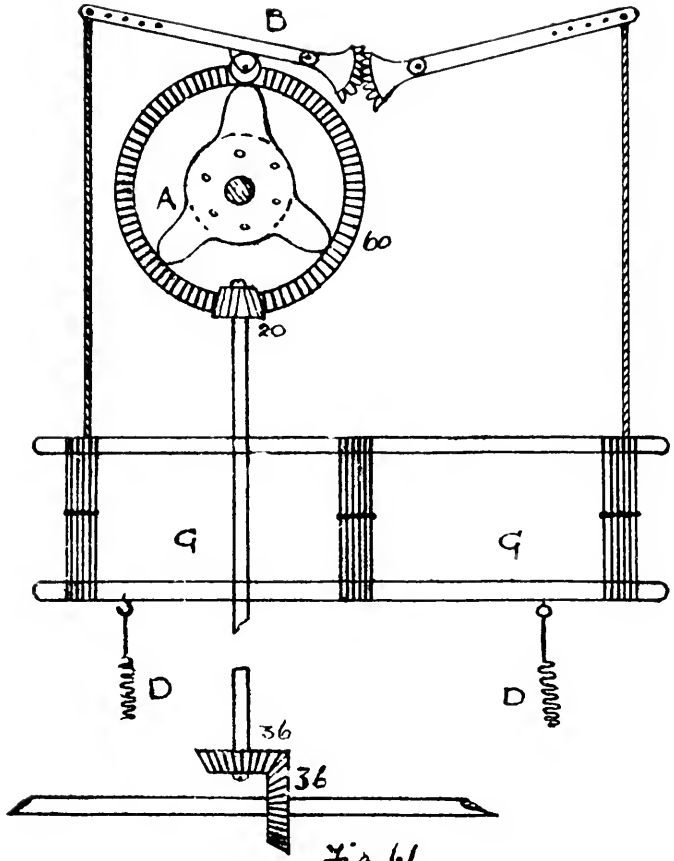



Fig. 61

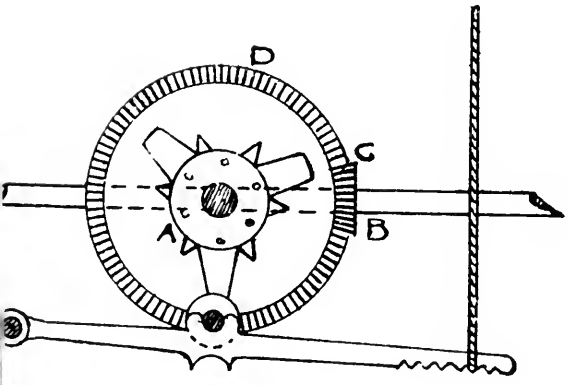



Fig. 62

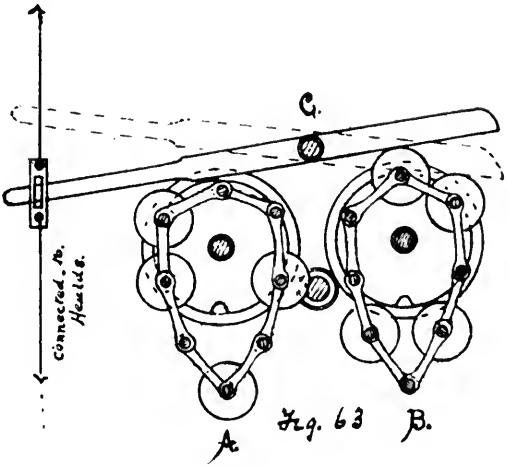



Fig. 63

UNDER AND OVER MOTIONS.

In dobby and side tappet looms, springs are generally fixed direct to the healds, underneath the loom; two springs to each heald; this is not a good arrangement inasmuch that the springs exert the greatest pull when the heald is lifted, and the least when the heald is at it lowest point, the strain increasing in proportion to the space through which the heald is lifted. Various forms of UNDERMOTIONS have been invented which prevent the springs from being stretched in the direct proportion to the lift of the heald. In Hahlo, Liebreich, and Hansons undermotion Fig. 64 to one end of B a heald stave is attached; the strap C passes round and is fixed to the eccentric pulley D, the other end of the strap is fixed to the spring N, which in its turn is fixed to the other end of B; when B is lifted Fig. 65 the strap nearest to the spring is pulled to the thinner side of the eccentric pulley D, and prevents the spring from stretching in direct proportion to the lift of B; the amount of eccentricity is such that a 5" lift of B gives a stretch of 3/4 only to the spring N.

In KENYONS UNDERMOTION Fig. 66 two levers B with their fulcrums at F are connected to the underside of the heald P through the cords D, B and B are connected by a spring C, when the heald is lifted the stretch of the spring is not in direct proportion to the lift, due to the levers gradually approaching the fulcrums. In some looms with tappets under the loom SPRING TOPS are used as illustrated in Fig. 67 by this means each heald can be operated independent of any other heald.

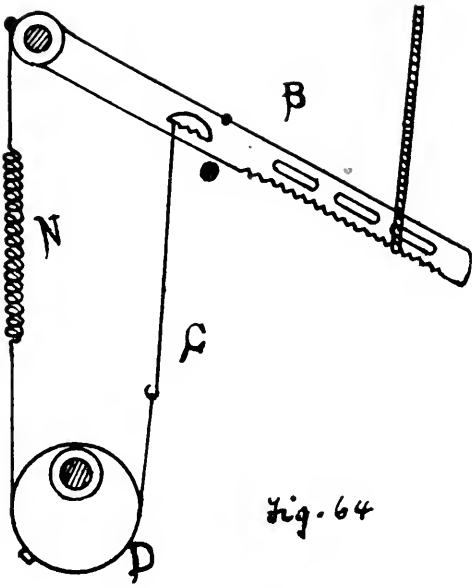



Fig. 64

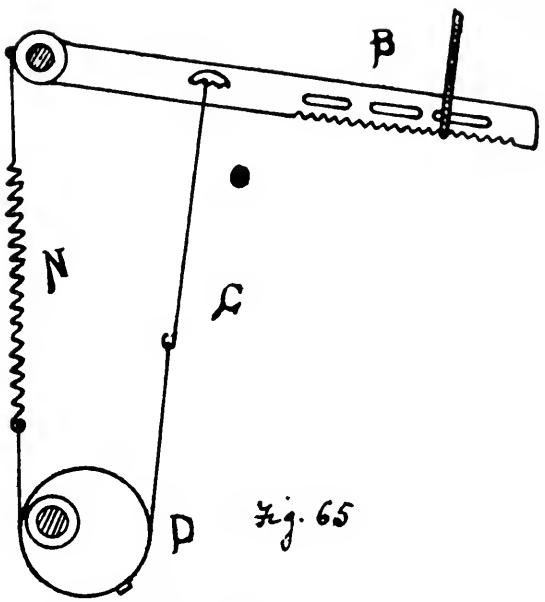



Fig. 65

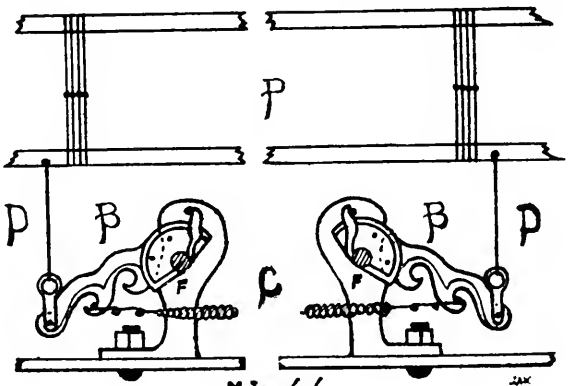



Fig. 66

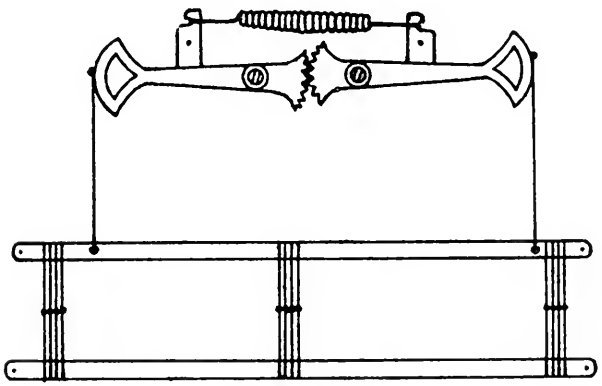


Fig. 67

## FIGURING WITH EXTRA WARP AND EXTRA WEFT

Extra material can be introduced into the cloth for figuring purposes only, as in the making of different coloured spots, the ground weave being plain, or any other simple weave. The extra material is introduced for ornamentation only, and when not floating on the face for that purpose, it is floating loosely behind the cloth. in cases of very long floats the loose material is cut away from the back of the cloth previous to the finishing process, when this is done the figuring ends are allowed sometimes to weave in plain order for one pick or for one end just before and after figuring, otherwise there is nothing to hold the extra material to the cloth, only the pressure of the ground ends or the ground picks.

EXTRA WARP is very largely used in the making of figured DHOOTY BORDERS, where the middle of the piece is plain cloth, at the sides coloured warp ends are crammed in along with the ground warp; the coloured ends are worked by heads or harness from the Dobby, and elaborate patterns are often produced; Fig 68 gives an example, arranged one end ground ☒ one end figure ■, fill in the whole of the ground weave

EXTRA WEFT is introduced in the production of small spot figures; a changing shuttle box is required; and if single picks of a given counts or colour are inserted a Pick and Pick loom, with changing shuttle boxes on each side will be required. Fig. 69 gives an extra weft spot, arranged 2 ground picks plain, 2 extra weft; fill in the ground. On space Fig. 70 give the pattern for an extra warp spot. On space Fig. 71 give an extra weft spot.

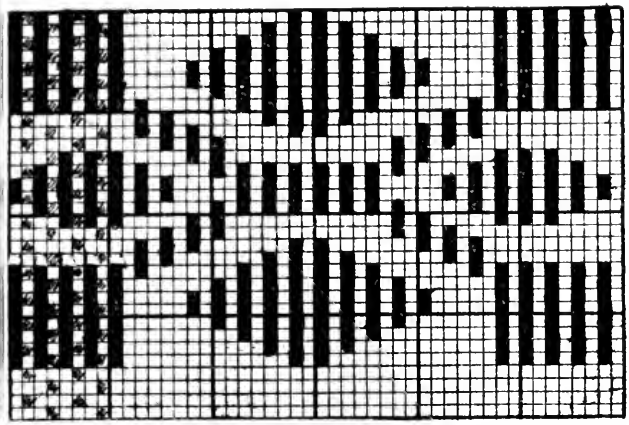


Fig. 68

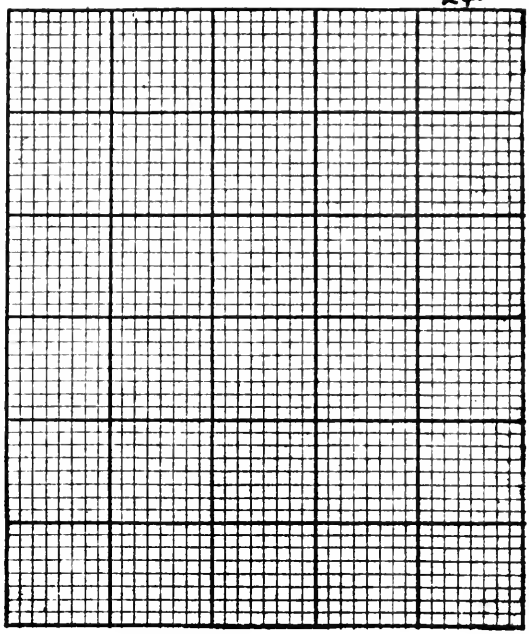


Fig. 71

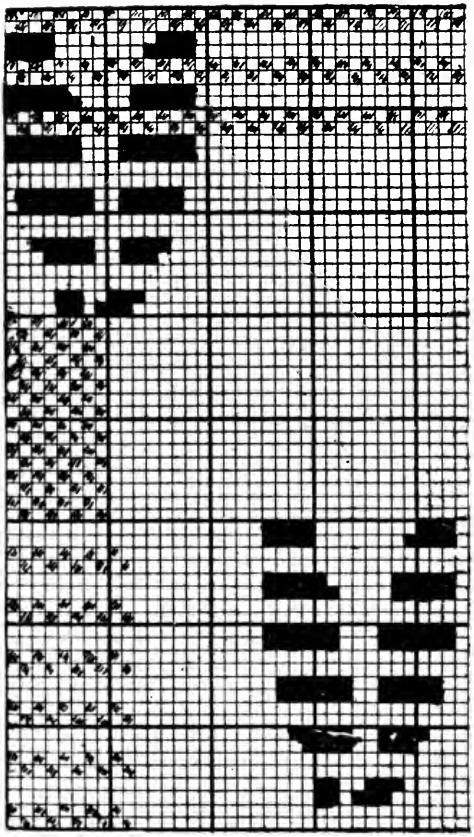


Fig. 69

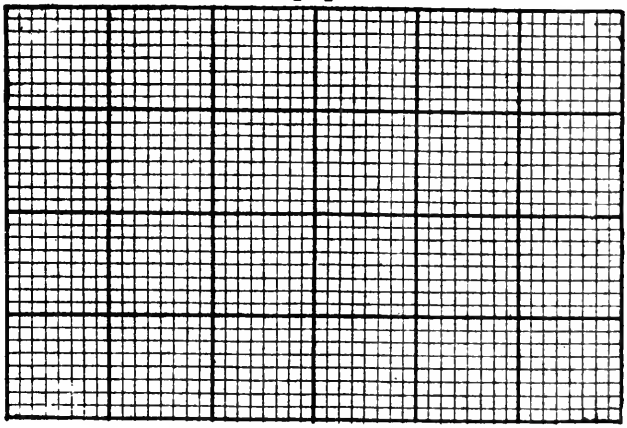


Fig. 70

Extra warp cloth

Extra weft cloth

## DOUBLE CLOTHS.

In the making of Double Cloths, two seperate warps and two seperate wefts are used. they may be of two different colours, each colour of warp interweaving with its own colour of weft, or they may be the same colour. If two colours of weft are used a changing shuttle box loom is required, if only one colour of weft is used an ordinary one shuttle loom will do. The two cloths may be the same or different weaves, they may be each seperate from each other, binding only at the selvege, or they may be bound together all over the fabric, and form one solid cloth, with the same or different patterns for the face and back. In placing the patterns on design paper, put down each pattern seperately namely the weaves or for the face and back cloths respectively; the patterns may be combined together for the production of a double cloth, by keeping strictly to the following rules.

① Place the pattern for the face cloth on its own ends and picks: let ■ equal the face pattern.

② Place the pattern for the back cloth on its own ends and picks; let ▨ equal the face pattern.

③ lift all the face ends when a back pick goes in: let × equal face ends lifted on back picks.

④ If the two cloths have to be bound together, lift up a back end into a face pick, and in such a position, that the threads situated on each side of it, and belonging to the face cloth are lifted

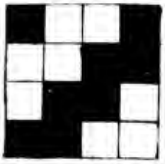



Fig. 78

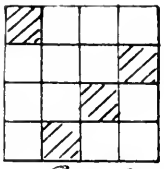
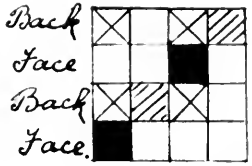



Fig. 79

Fig. 72

Fig. 73



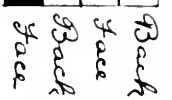
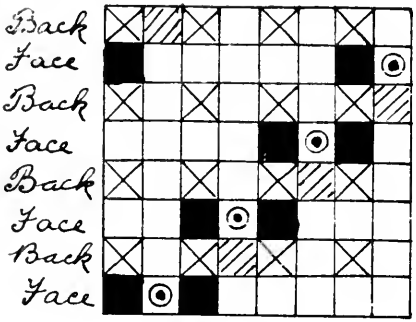




Fig. 74



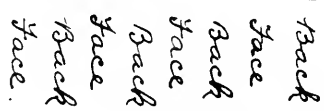
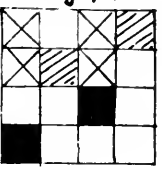




Fig. 80

Fig. 75

Fig. 76



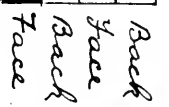




Fig. 77

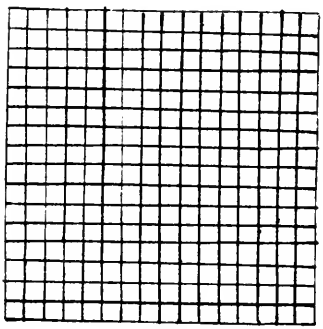


Fig. 81

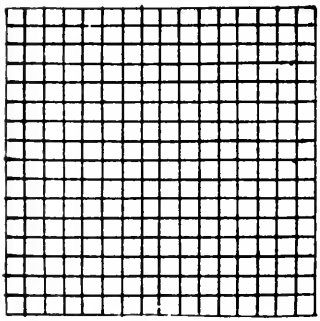
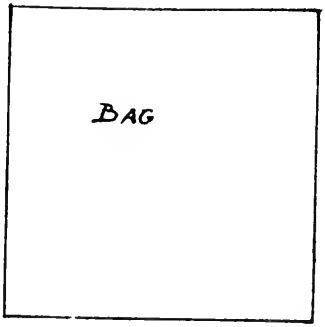
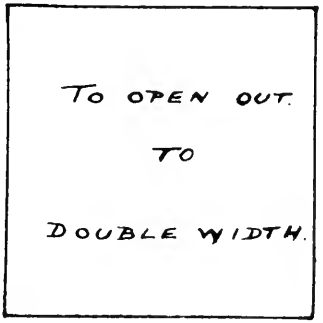


Fig. 82



at the same time, also if possible, let the back end be lifted immediately before or after the same end has been lifted to form the back cloth, let ⊙ equal the back ends lifted into the face cloth. Fig. 72 gives a pattern for the face cloth, Fig. 73 the pattern for the back cloth. Fig. 74 gives the two patterns combined 1 face 1 back in ends and picks, the resultant pattern is a double cloth in the form of a bag, binding at each selvege. Figs. 75 and 76 give face and back cloths respectively, Fig. 77 shows the two combined 2 face 2 back in picks, 1 face 1 back in ends, the result is a double cloth to open out to double the width, binding at one selvege only. Figs. 78 and 79 give the face and back weaves respectively, Fig. 80 shows the two combined 1 end face 1 back in both ends and picks, the ⊙'s are back ends lifted into the face cloth, binding the two cloths together to make a solid fabric. On Space Fig. 81 give the design for a tube or bag (sample cloth). In Fig. 82 give the design for a cloth to open out double width (sample cloth)

Figs. 83 and 84 give face and back patterns. Fig. 85 shows the same combined, put in the peg plan. Give the peg plan for Fig 88. In Fig 91 combine 89 and make a bag. In Fig. 94 combine 92 and 93 to open out to double the width. In Fig. 97 combine 95 and 96 and stitch the two cloths together to form one solid fabric.

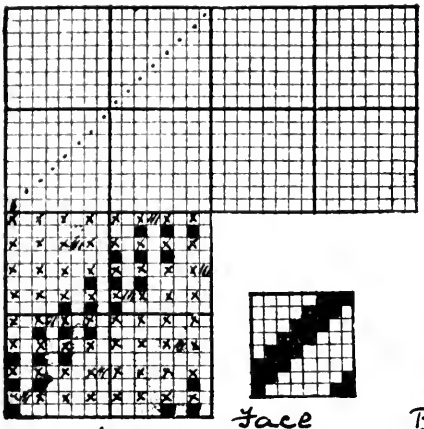
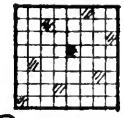


Fig. 85



Face
Fig. 83



Back
Fig. 84

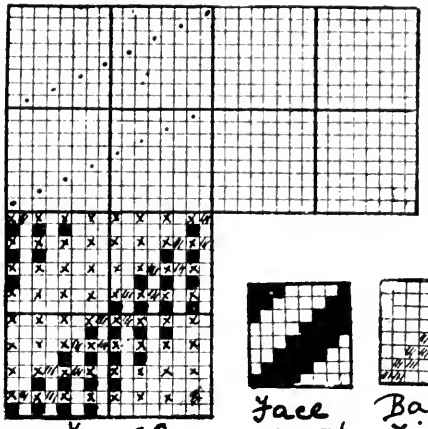
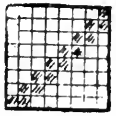


Fig. 88

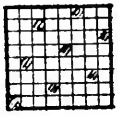


Face
Fig. 86



Back
Fig. 84

Face
Fig. 89



Back
Fig. 90

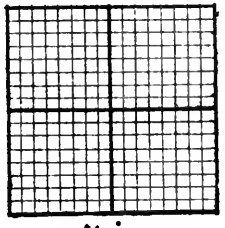
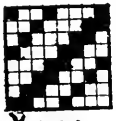
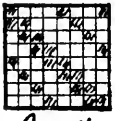


Fig. 91



Face
Fig. 92



Back
Fig. 93

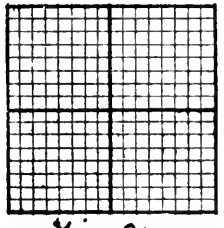
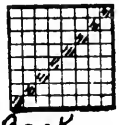


Fig. 94

Face
Fig. 95



Back
Fig. 96

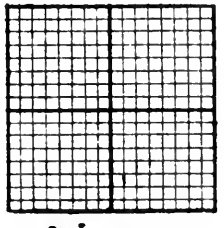


Fig. 94

DOUBLE CLOTHS.

The terms two, three or four ply, are often used to denote that two or three or four cloths are woven superimposed one upon the other. Fig 98 gives an example of a two ply cloth the number 1 being the upper and number 2 the lower cloth. The woven fabric will be in the form of a long tube, but by allowing the ends to weave in plain order at intervals the result would be a bag. Fig 99 gives an example of a cloth to open out to double the width. Fig 100 illustrates the principle of construction of a cloth to open out to three times the width. In Figs 99 and 100 small circles are shown, if the threads enclosed by these circles are lifted the cloths will bind. Sections of the cloths for Fig 98. 99 and 100 are also shown.

On Figs 101 and 102 show the patterns for face and back cloths respectively, combine the two together to make a double cloth on space 103 in the form of a tube or bag.

On Figs 104 and 105 give the patterns for a face and back cloth, combine the two together to make a cloth to open out to double the width on the space Fig 106.

On Fig 104 and 108 make face and back cloth patterns respectively, on the space Fig. 109 combine the two cloths together, lift the back warp into the face cloth at intervals for binding purposes. In Figs 103, 106 and 109 let the circles below the design represent warp ends and make sections of the respective cloths by allowing the weft to interlace with the circles.

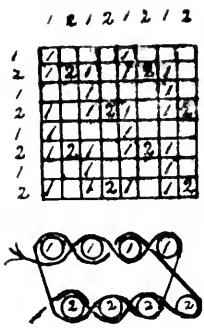


Fig. 98

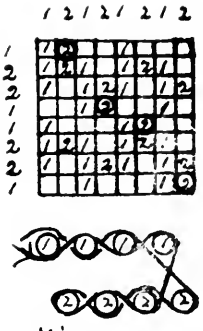


Fig. 99

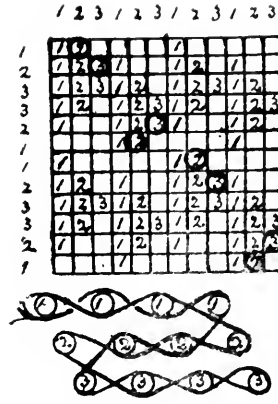


Fig. 100

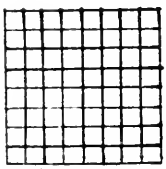


Fig. 101

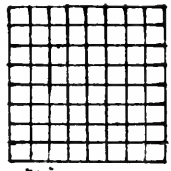


Fig. 102

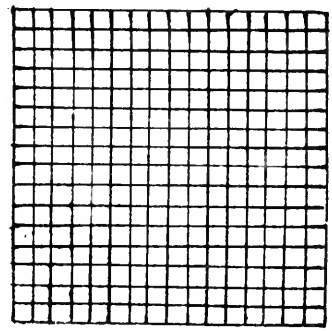


Fig. 106

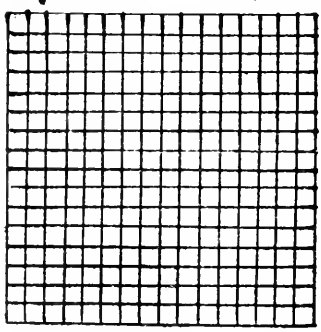


Fig. 103

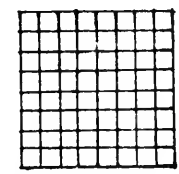


Fig. 104

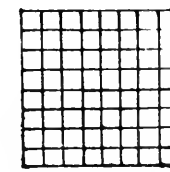


Fig. 105

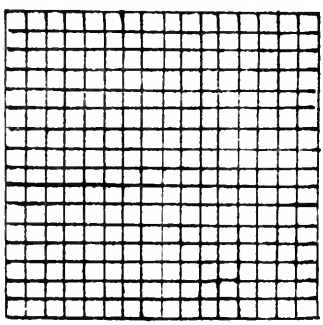


Fig. 109

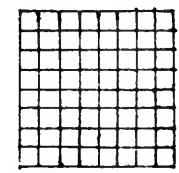


Fig. 104

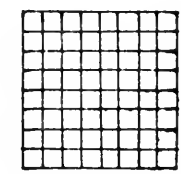


Fig. 108

DOUBLE CLOTH. Fig 110 gives a check effect and Fig 111 shows shows the same combined with an eight end satin back cloth ▨ the back ends being lifted into the face cloth ■ binding the two cloths together. complete the pattern. Make a pattern for a double cloth (binding) Fig 112.

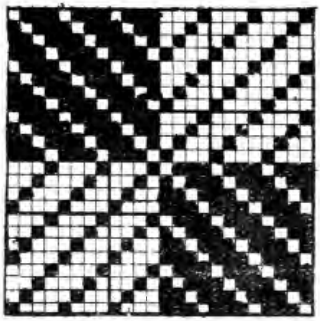


Fig. 110

DOUBLE CLOTH.

Binding.

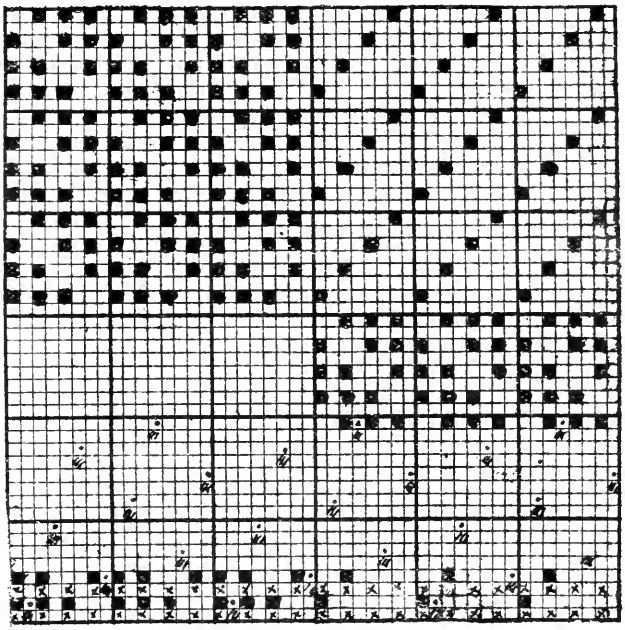


Fig. 111

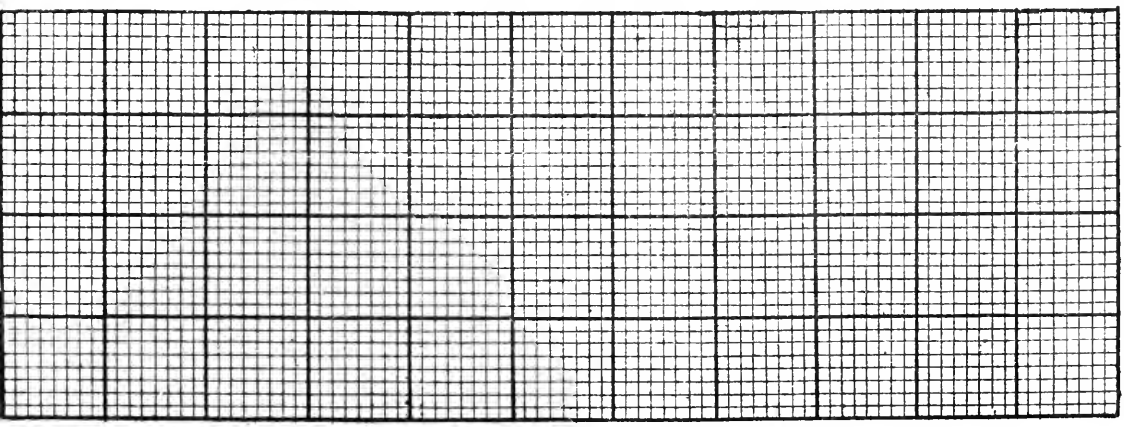


Fig. 112

In DOUBLE PLAIN CLOTH, the pattern is produced by two plain cloths generally of different colours changing their positions

Fig. 113

This effect is reproduced on Design paper in Fig. 114

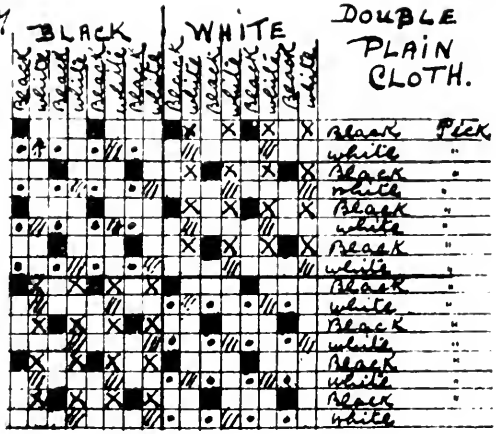


Fig. 114

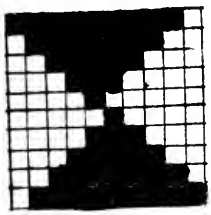


Fig. 115

On the space Fig. 116 reproduce Fig. 115

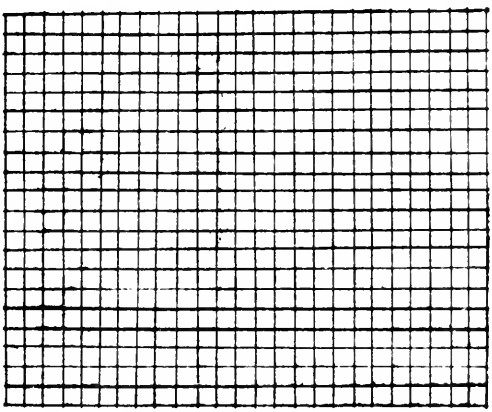


Fig. 116

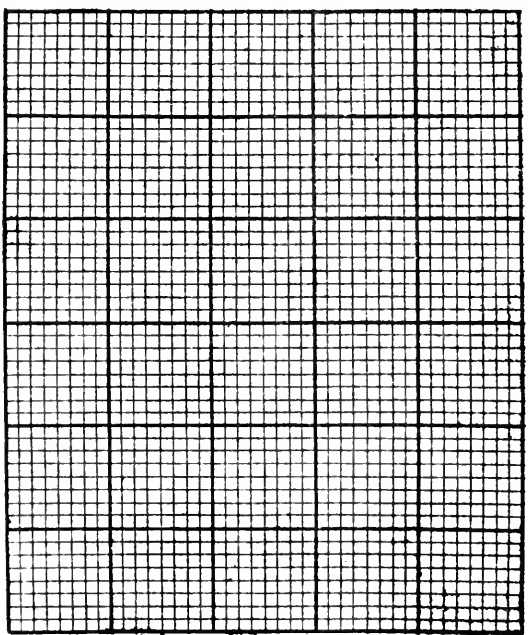


Fig. 114

DOUBLE PLAIN CLOTH.

PIQUES. These cloths are made with a plain face, and the figured effect of the pattern is produced by using a back warp and bringing up into the face cloth for figuring only, and as the back warp is very heavily weighted, being placed on a seperate beam, it tends to pull down the face cloth, producing a figure on the face cloth in the order that the back ends have been lifted, the effect is somewhat similiar to what would be produced by using a needle and thread and tightly stitching the cloth to suit some figured effect. The cloths are generally made 2 face ends to 1 back end..

Fig. 118 gives the motive or the effect it is desired to produce in a pattern. Fig. 119 gives one repeat, and Fig. 120 gives the pattern on design paper for a Piqué cloth: the dots indicate the face pattern, plain cloth, the filled in squares the back ends, it will be seen that whenever a back end is lifted, it remains up for two picks, this enables the back warp to make a better impression on the face cloth, the arrangement 2 face ends 1 back end. Fig. 121 gives a twill and Fig 122 the same arranged to give a pique twill effect, the arrangement being 2 face ends 1 back end: the back ends remaining up for two picks.

Fig 123 gives the motive for a Piqué spot, and Fig 124 shows the method of arranging the same on design paper, 2 face 1 back in ends, back ends up for two picks. ⊡ = plain face ■ = Back warp

Complete the pattern here commenced.

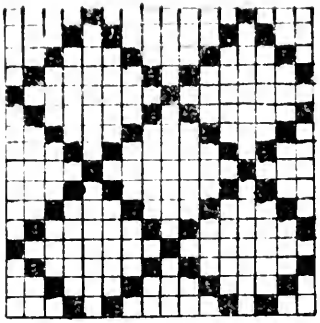


Fig. 118

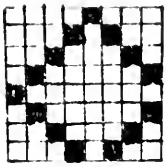


Fig. 119

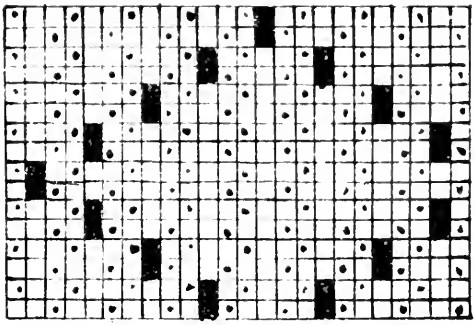


Fig. 120

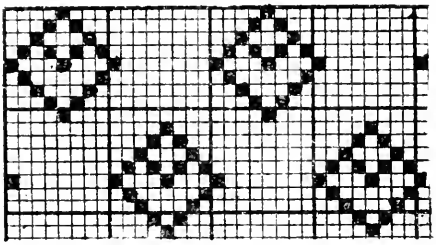


Fig. 123

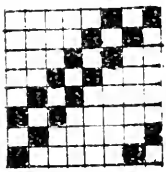


Fig 121

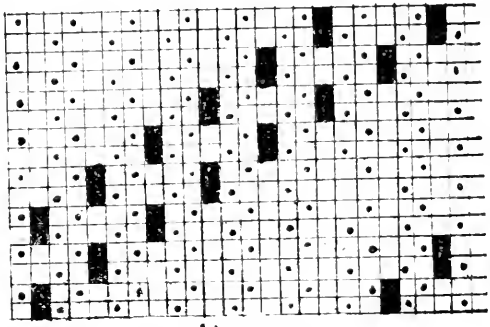


Fig. 122

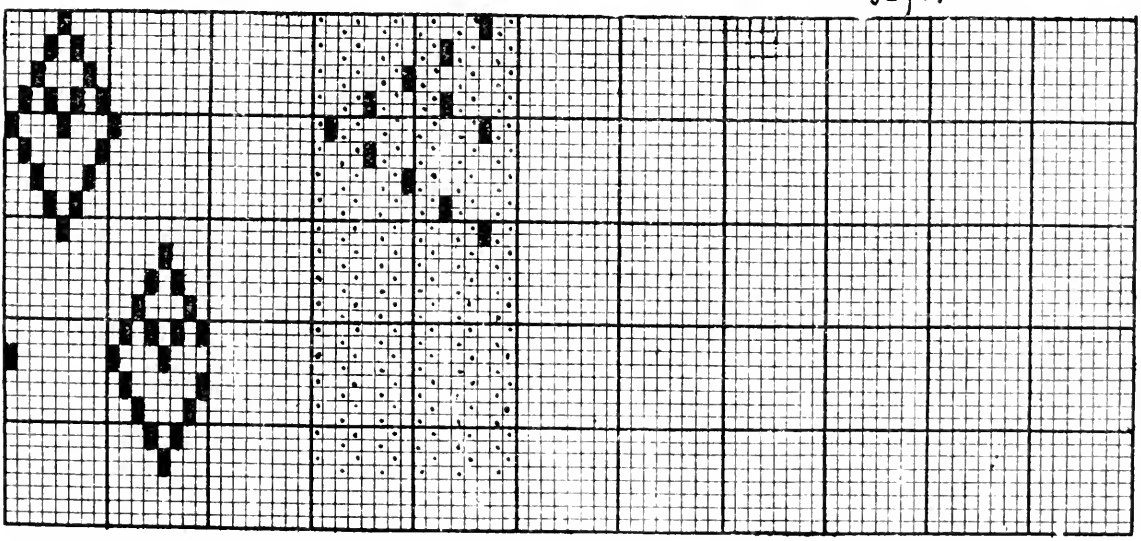


Fig. 124

PIQUES. In many makes of these cloths, wadding picks are inserted, these picks consist of coarse weft, and are inserted between the face and back warps, for the purpose of padding, and they are the means of giving to the cloth an embossed character.

There are two methods of inserting these wadding picks, by one method the picks lie straight across the piece, by the other method the picks are drawn out of the straight line, and appear more or less wavy across the piece.

Fig 125 gives the motive for a Piqué pattern. Fig. 126 shows the same arranged on design paper, the arrangement being 2 face 1 back in ends, and 4 face 2 wadding in picks, the back ends remaining up for 3 picks, 2 picks into the face, and 1 pick on the wadding, this keeps the wadding picks in a straight line. ⊡ = face cloth. ■ = Back cloth. ⊡ = wadding picks. The Xs indicate the loomming, the plain cloth warp being drawn on the front 4 shafts. The peg plan is also given. These cloths are usually made with 3 ends in one dent, with the back end in the middle position, one useful method of showing the denting is illustrated in Fig. 126. below the design as indicated ⊡

On Space Fig. 124 give the pattern for a Pique cord.

On Space Fig. 128 give another pattern for a Pique cord.

On the space Fig. 129 give the pattern for a Pique Spot effect.

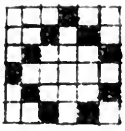


Fig. 125

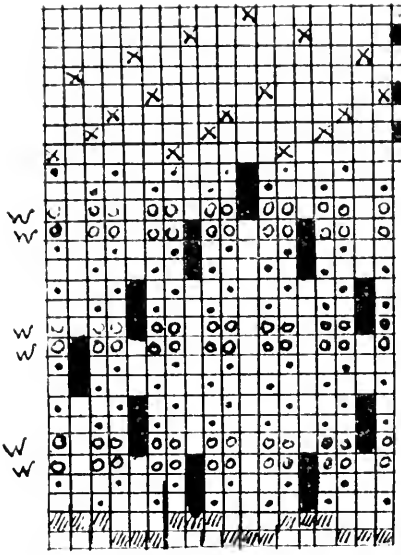
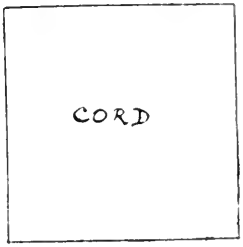


Fig 126



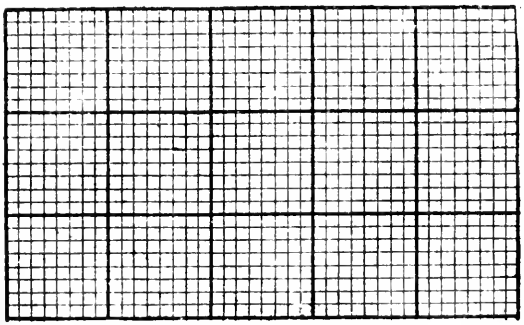



Fig 128

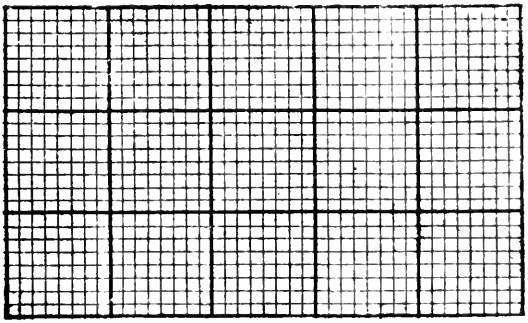


Fig. 124

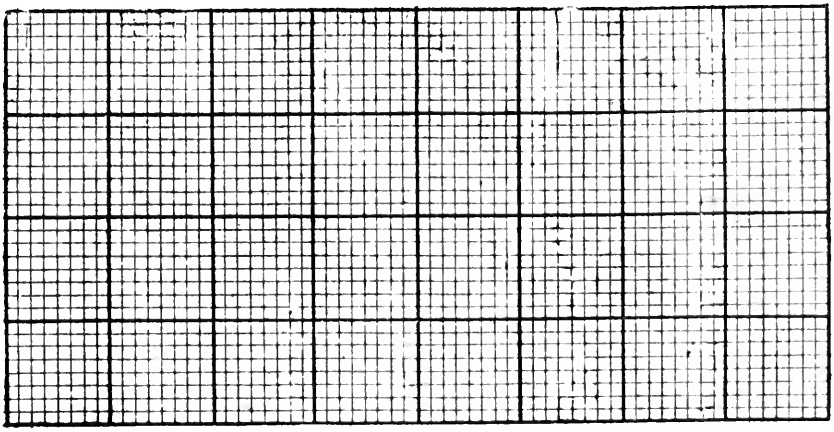


Fig. 129

PIQUÉS. Fig. 130 is a style of design very common in these cloths, the manner of lifting the back ends into the face cloth, tends to pull the wadding picks out of the straight line, producing a somewhat peculiar effect, difficult to understand, on the first examination of this type of cloth. Fig. 128[a] gives the motive for the pattern and Fig 129[a] the peg plan, the o[s] and the .[s] being pegged equally with the filled in squares. Complete Fig. 130
Fig. 131 is the motive for Fig. 132
Fig. 133 is the motive for Fig. 134
Fig 135 is the motive for Fig. 136
The warp for the plain cloth is drawn on the front four shafts, and the back warp on the shafts behind. Fig. 134 gives the looming of back warp to suit peg plans 136 and 134. Fig 139 is the looming for back warp for peg plans 129 and and 132, these back ends alternate with the ends from the front four healds weaving plain, in the order of two face ends one back end.
Fig. 140 gives the motive, Fig. 141 the peg plan and Fig. 139 the looming of back ends, for the design Fig 142. In this example the wadding picks ◻ lie straight, the back ends are lifted for two picks into the face and one pick into the back, the arrangement being 4 ground picks 2 wadding picks, Fig. 145 gives the same design showing how the back ends weave in plain order on back picks, this prevents long floats behind the cloth. B = back picks · Face picks. o = wadding. ■ = back ends lifted into face cloth. Fig. 143 gives the motive for Fig 144. 2 face picks 1 wadding.

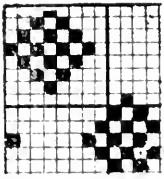


Fig. 128a

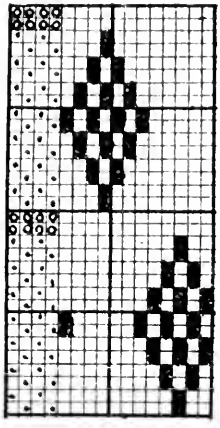


Fig. 129a

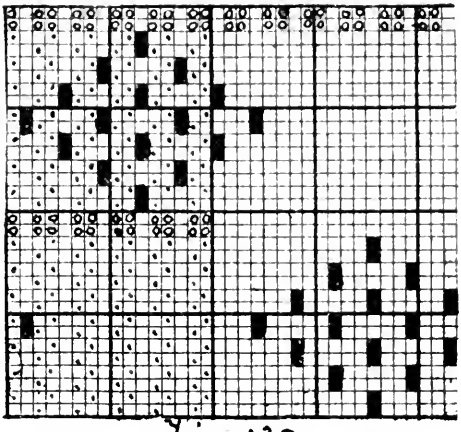



Fig. 130

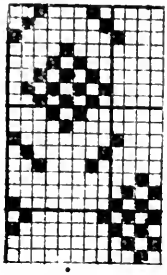


Fig. 131

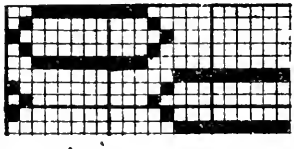


Fig. 133

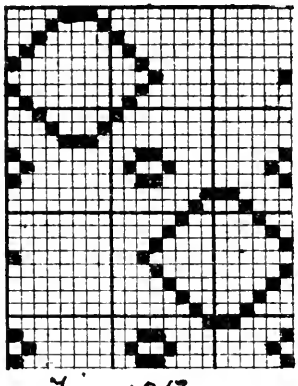


Fig. 135

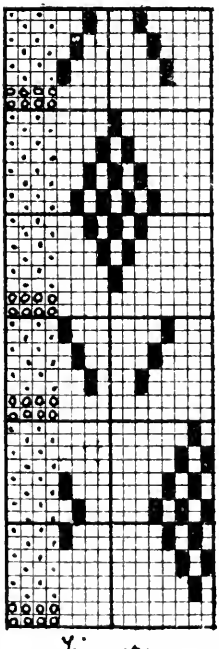


Fig. 132

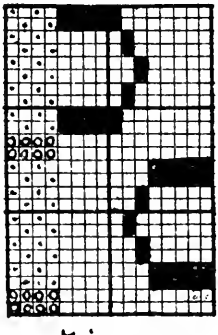


Fig. 134

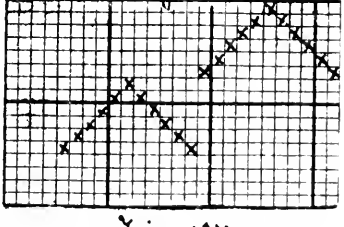


Fig. 134

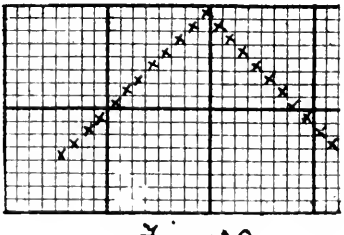


Fig. 138

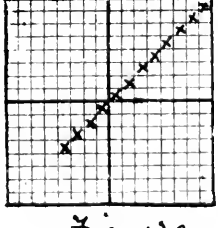


Fig. 139

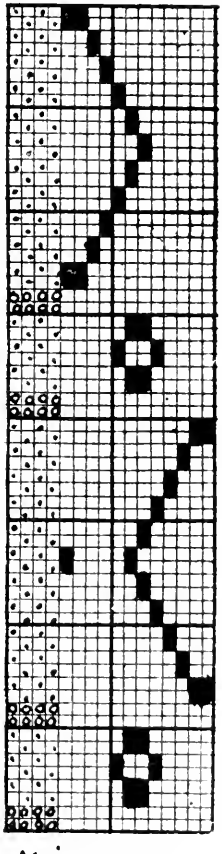


Fig. 136

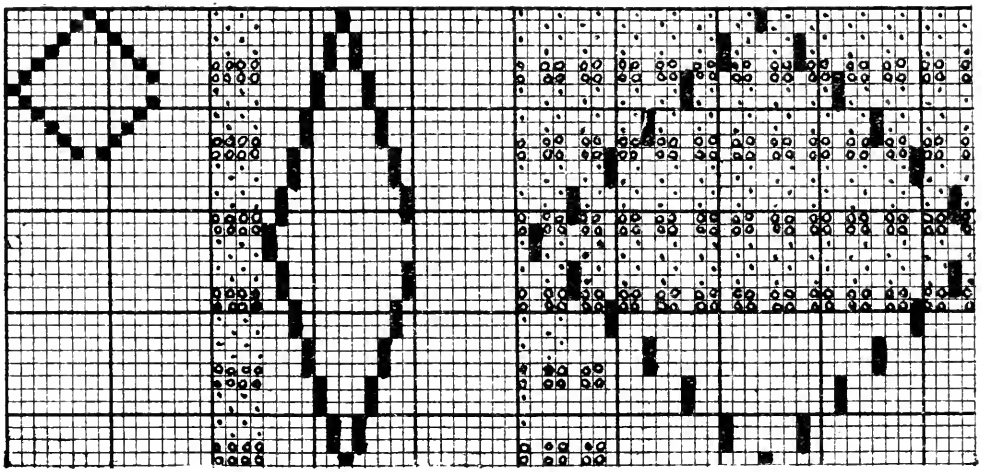


Fig. 140 Fig. 141 Fig. 142

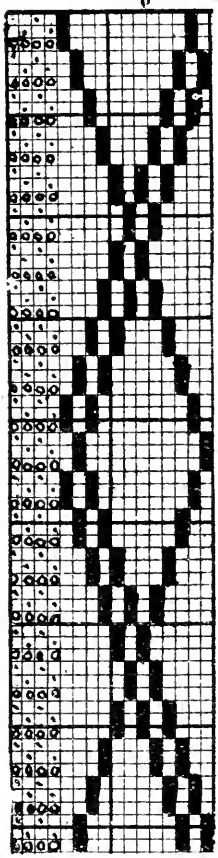


Fig. 144

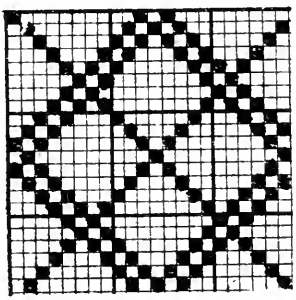
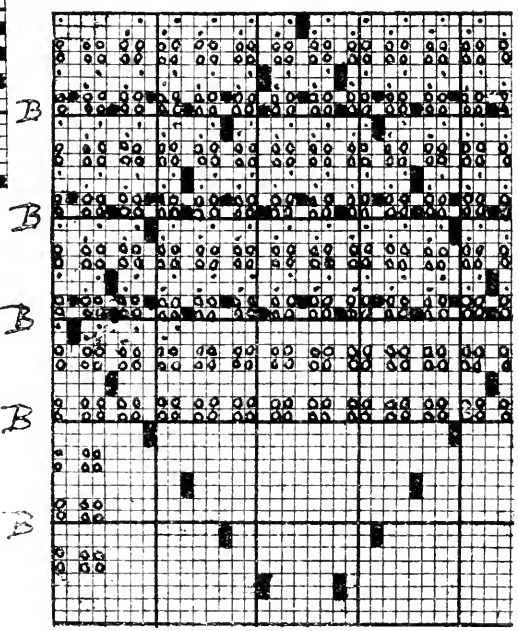


Fig. 143



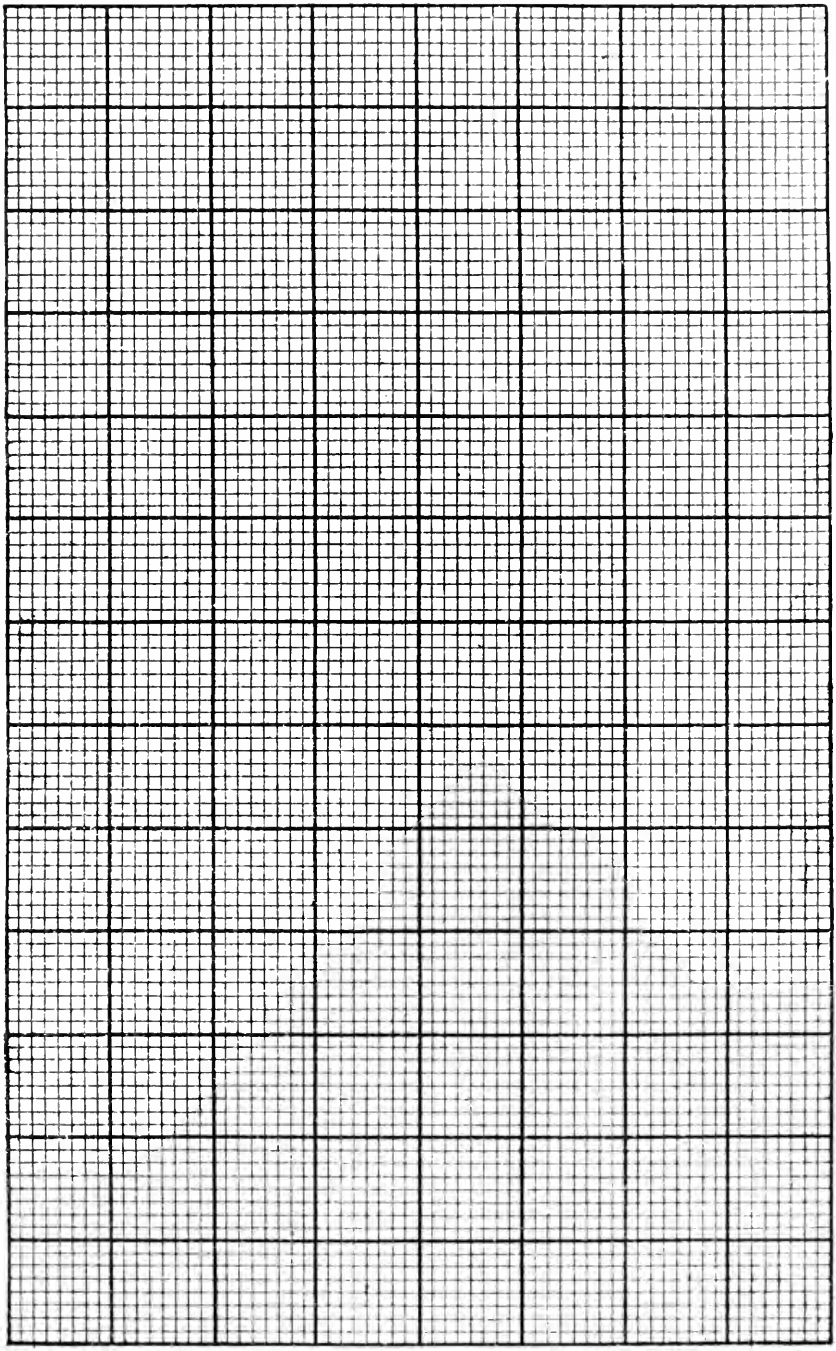
B B B B B

Fig. 145

PIQUÉ

PIQUÉ

PIQUÉ



## GAUZE or LENO WEAVING.

In this class of weaving, the pattern is produced by some of the threads of warp, twisting around other threads; to accomplish this a Special Kind of heald is used termed a Doup heald Fig. 146 it consists of an ordinary heald Fig. 144 and a half a heald as shown at A in Fig. 146 the heald and the loose slip is termed the doup, and the loose half the loose slip.

Fig. 148 illustrates the crossing of the ends in a simple gauze example, and Figs 149 and 150 show the arrangement of healds and method of working to produce the cloth; the letters are for the same parts in both sketches. A = loose slip. B = Doup. C = Standard, or the heald through which the doup end is drawn, in addition to being drawn through the loose slip A of the doup; the heald D through which the crossed end E is drawn, in this example, never lifts; the Doup end F being lifted first on one side and then the other of the stationary end. In Fig 149 the standard and the loose slip are lifted bringing up the thread on the near side and giving the open shed crossing. In Fig. 150 the standard C remains down the Doup AB. is lifted and takes up the thread on the far side of the stationary end, and producing the crossed shed crossing. To prevent a breakage of the yarn by the crossing of the ends in the shed, all the doup ends are drawn over a slackener bar which is released by one of the jacks of the

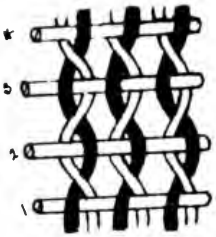


Fig. 148

Open shed crossing

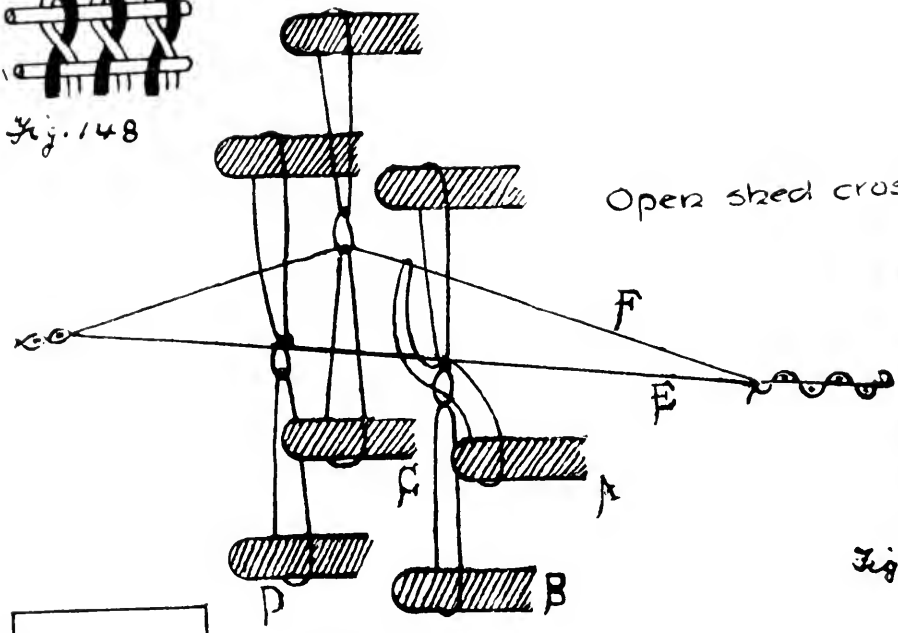



Fig. 149

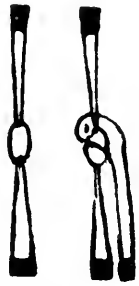


Fig. 147

Fig. 146

CLOTH

Crossed shed

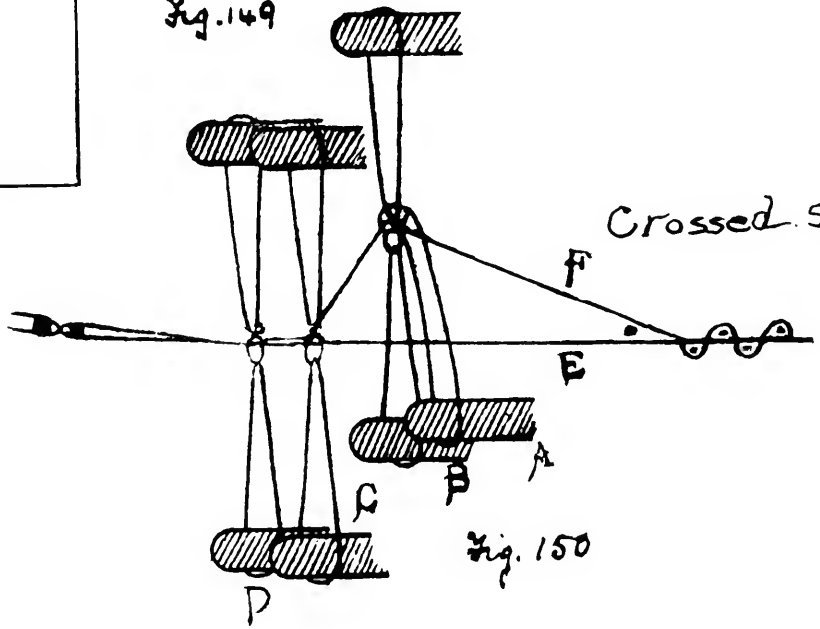



Fig. 150

and allows the doup ends to give way.
Fig 151 illustrates the method of looming and peg plan the horizontal lines represent the heards, and the X's the heards through which the respective ends are drawn. L S = loose slip. D = doup. S = slackener. The numbers 1. 2. 3. 4 on the lines at right angles to the heards indicate the picks, the X's indicate the lifting of the heards on the respective picks. Fig 152 shows Fig. 151 on design paper, with looming and peg plan. This method is a preferable one, as it enables the work to be done more quickly, the X's indicate the lifting of the heard and O's the lifting of the doup. In filling in the looming and peg plan the following rules will be found useful:

① The slackener is always placed behind all the heards
② The loose slip is placed in front, immediately followed by the doup.
③ In putting down the peg plan, put down the liftings of the ordinary heards, omitting the doups, loose slips and slackners.
④ Put down the lifting for the doup, and lift the slackner belonging to it at the same time, also lift the loose slip.
⑤ Put down the lifting of the standard, or the heard through which the douping end is drawn, and lift the loose slip at the same time.

Fig. 153 gives a plan of a cloth and Fig. 154 shows the same on design paper, with looming and peg plan.
Fig. 155 shows one thread crossing three ends, and Fig. 156 the same on design paper.

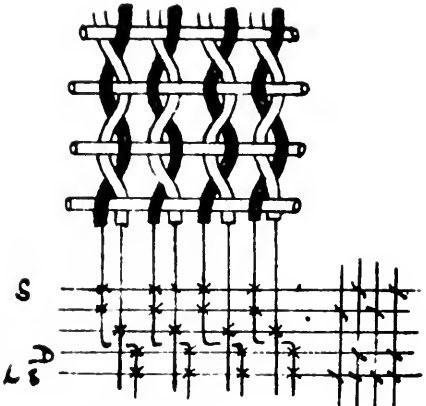



Fig. 151

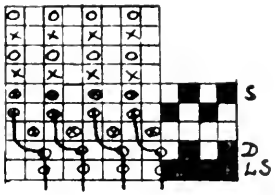



Fig. 152

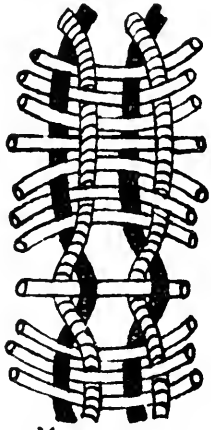


Fig. 153

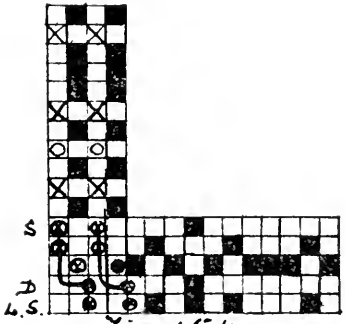



Fig. 154

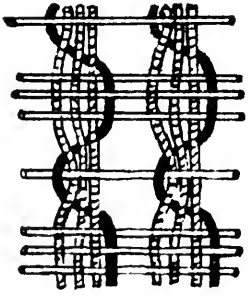


Fig. 155

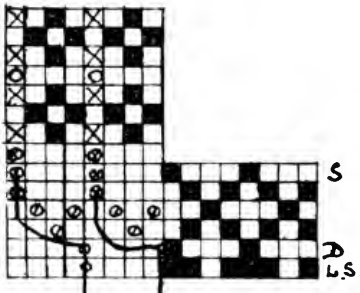


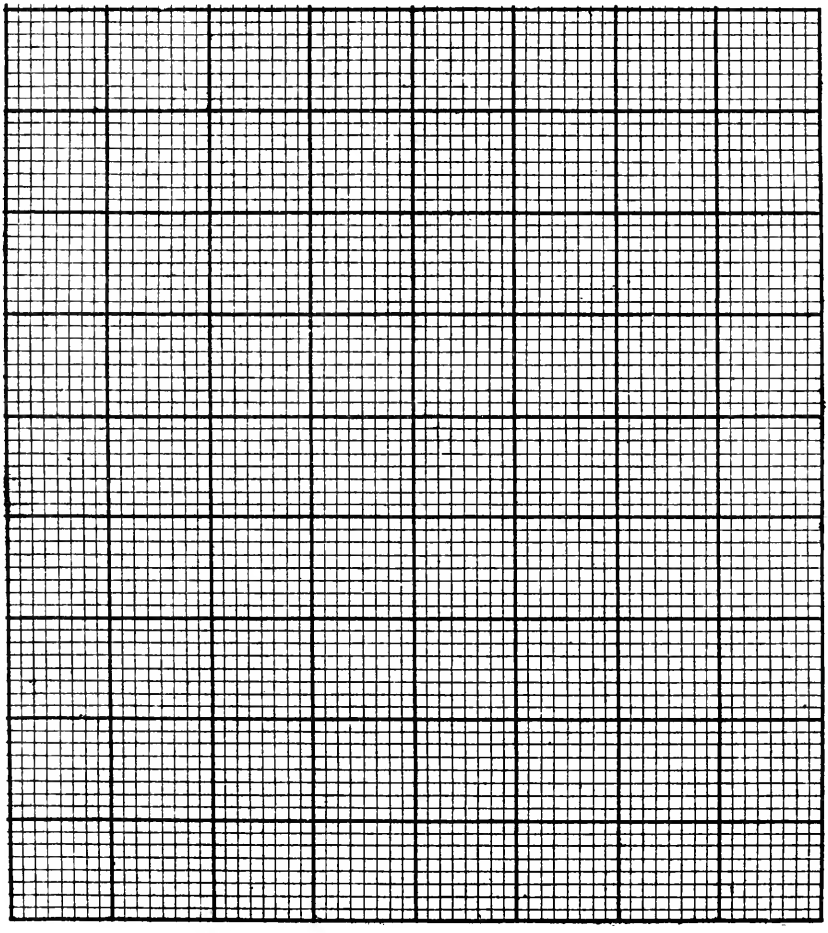

Fig. 156

A number of examples showing plan of cloth with the patterns worked out on design paper are given on pages 46, 47 & 48 as under.

Fig. 157 plan of cloth, Fig. 158 showing the same on design paper
Fig. 159 plan of cloth, Fig. 160 showing the same on design paper.
Fig. 161 plan of cloth, Fig. 162 showing the same on design paper
Fig. 163 plan of cloth. Fig. 164 showing the same on design paper
It is advisable to work out a series of leno cloths on design paper, showing looming and peg plans complete. for that purpose spaces are provided.

LENO

LENO



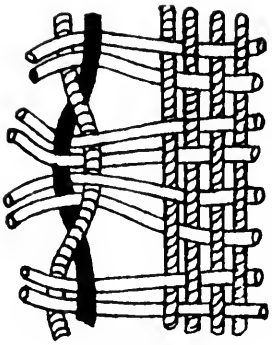
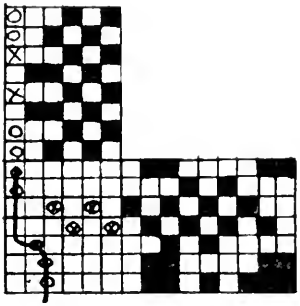


Fig. 157



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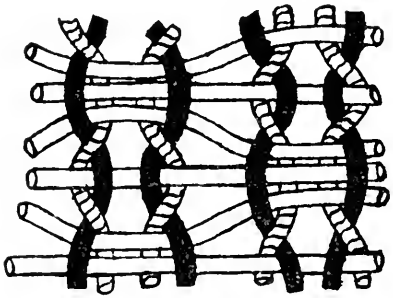

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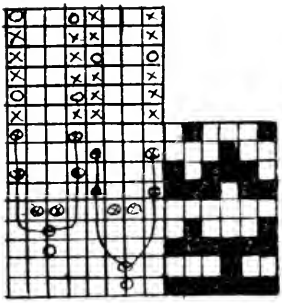

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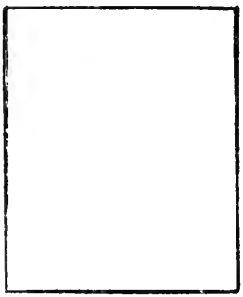

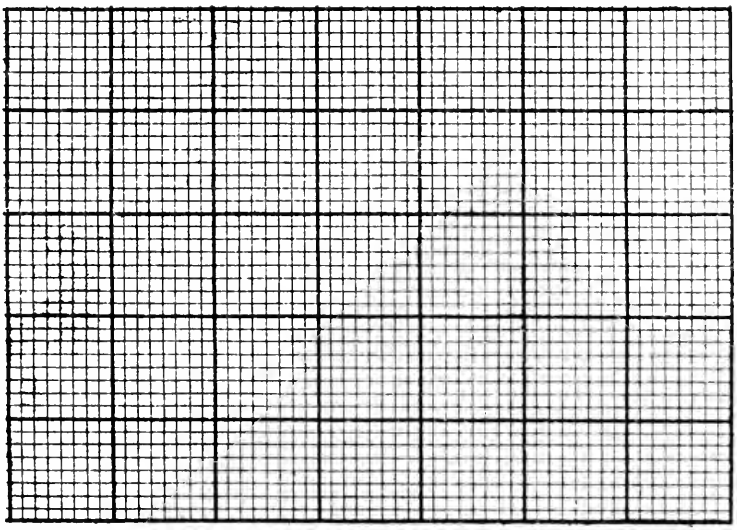

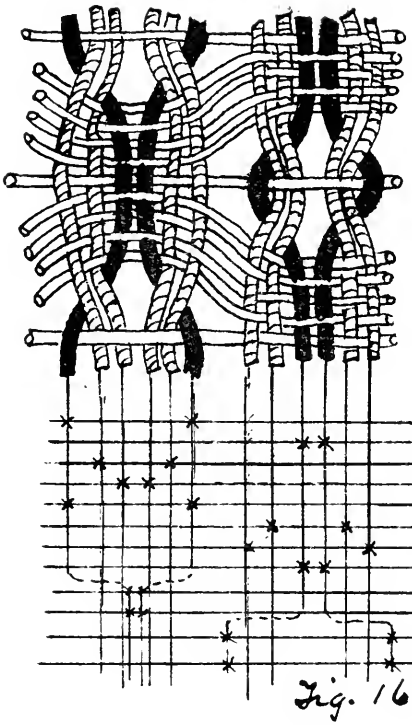

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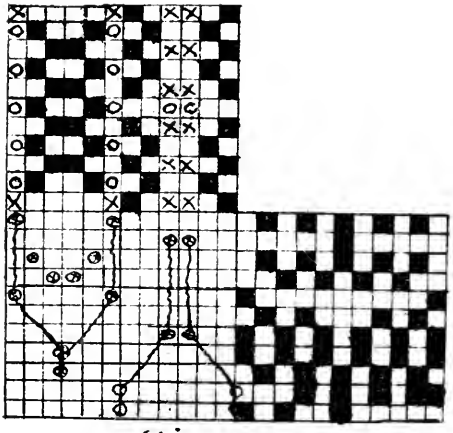

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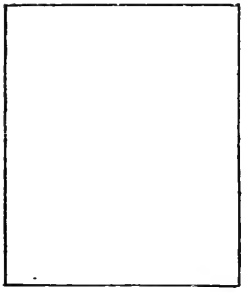
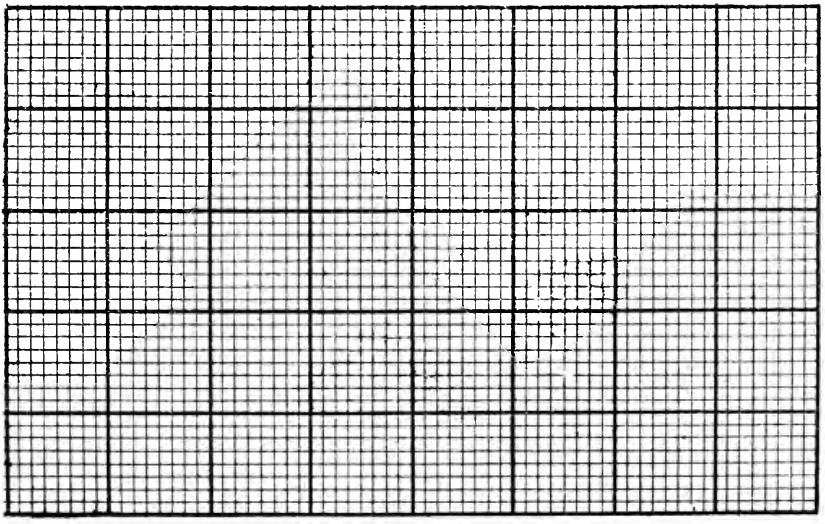




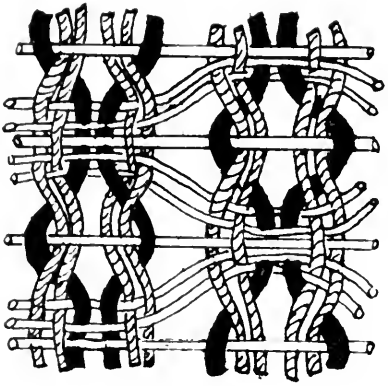


Fig 163

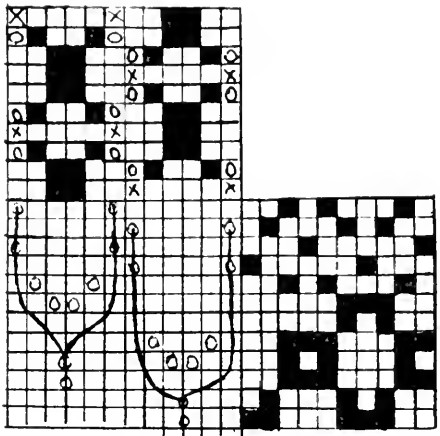


Fig. 164

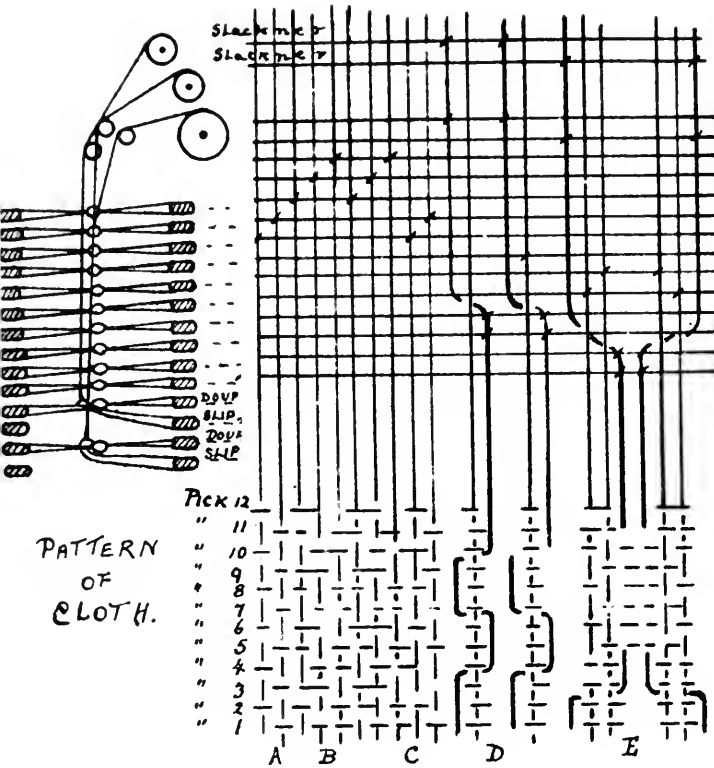
LENO

LENO

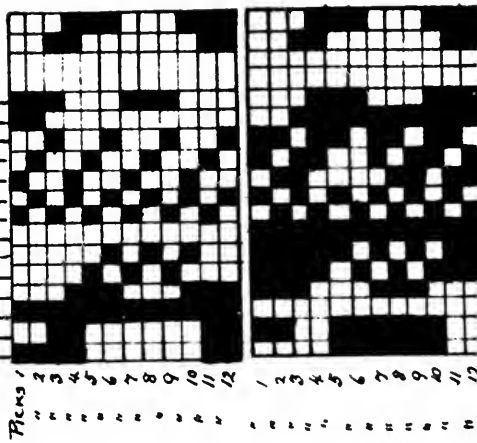
LENO WEAVING. Fig 165 shows the arrangement of a leno pattern using two doups; a pattern plan of the cloth is shown, and above the pattern is the looming, to the left of the looming is the arrangement of the healds and beams, and to the right the peg plan for both Bottom and Top doups. Leaving out the healds and the beams this system affords a quick and ready method of placing patterns on paper, it is also useful in the making of originals designs, as the effect produced is more easily to follow than is the case when the patterns are placed on design paper.

TOP DOUPS. In Fig 165 the peg plan for Top Doups, the blanks become filled in squares throughout, except the slackners, which remain the same. Top Doups have many advantages over bottom doups. ① The pattern is on the face of the cloth, therefore any imperfections can be more readily seen. ② The doups are in a more convenient position for repairing ③ Shaker contrivances can be more readily adopted, and become more direct in their action, this is more especially so in the case of using Tappets for weaving lenos.

TAPPETS. Fig 166 illustrates the arrangement when weaving a Gauze cloth with tappets. Fig 167 illustrates the pattern produced In Fig 166 1, is the loose slip connected by a spring to the fixed arm 10; 2, is the doup heald connected to the top roller and also to the slackner lever 5 with its fulcrum at F, the other end 6 is connected by 7 and 8 to the slackener rod 9 over which the doup warp passes; the crossed and crossing ends are worked from the same beam; 3 is the heald for the crossed end; 4 is the heald for the end which is lifted on every pick, the tappets 12 and 14 work the healds 2 and 3 also no. 1 the loose slip Smaller Tappets 13 and 13 work heald 4, pulling it down a half lift just previous to the crossing taking place.




PATTERN OF CLOTH.



PEG PLAN for BOTTOM DOUPS.

Fig. 165

PEG PLAN for TOP DOUPS.

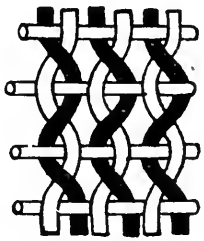


Fig. 164

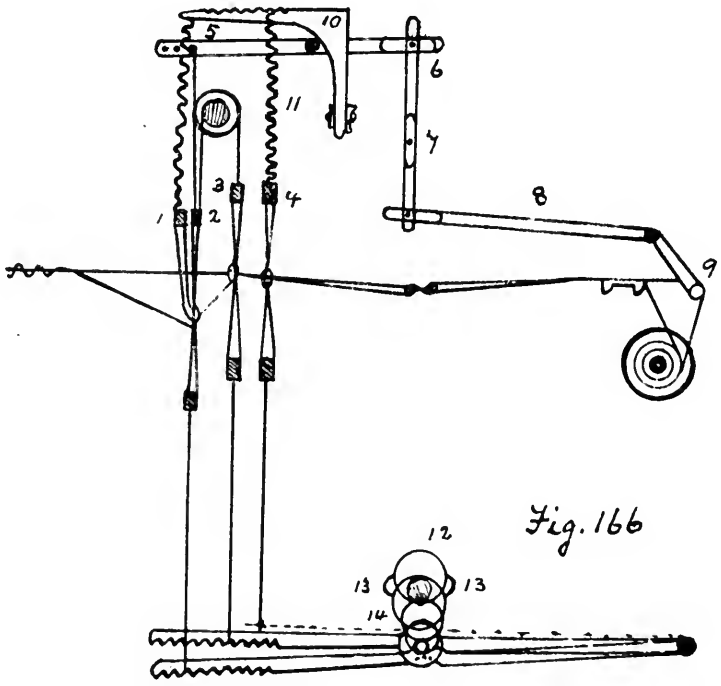



Fig. 166

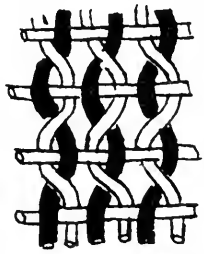
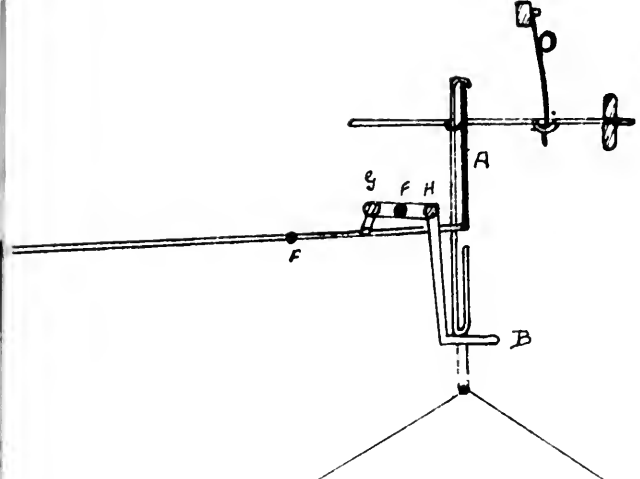


Fig. 168.

SHAKER arrangements are required both in Dobbies and in Jappets whenever a shed is made immediately before or after a shed has been made by the crossing end, namely the heald through which the doupping end is drawn, in addition to being drawn through the doup; D and E in Fig. 165 will require a Shaker, so also will the example Fig. 169. The object of the Shakers is to give a half lift to the crossed ends at the moment of crossing.

SINGLE LIFT DOBBY'S are the most suitable for weaving hemps; a consideration of the action taking place in the weaving of a pure gauze cloth will make the matter clear: in Fig. 168 the doup end is lifted on every pick, (and the crossed end is never lifted), on the 1st pick it is lifted by the heald, on the 2nd pick by the doup; in a Single lift Dobby all the healds fall to the lowest point or come to a centre position on each pick, and are then lifted to form the next shed, by this means the crossing end can easily pass underneath the stationary end and be lifted first on one side and then the other.

Fig 171 & 172 give front and end elevations of a Centre Shed Dobby. It is worked on the same principle as a Jacquard by means of cards, it is worked from an excentric on the crank shaft; there is a rising griffe A and a falling bottom board B on which all the hooks rest. as A goes up it causes B to move down through the connecting levers G. H. and thus opens the shed from the centre on each pick. Shakers are applied to Dobby's of the Hattersley type. as shown in Fig 175 where a rod A from the crank arm is connected to a short lever B to which all healds requiring the half lift are attached. In the Burnley Dobby Fig 174 the bowl E passing the elbow lever L lifts all the crossed ends on doup crossings



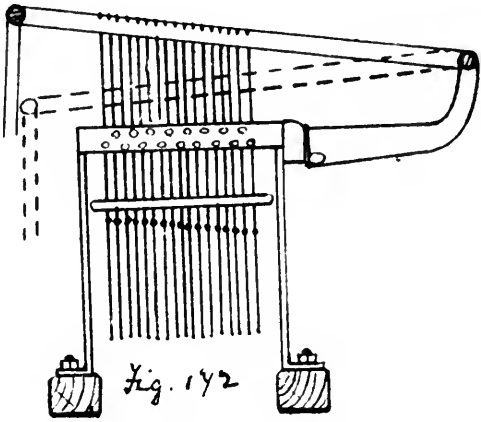



Fig. 142

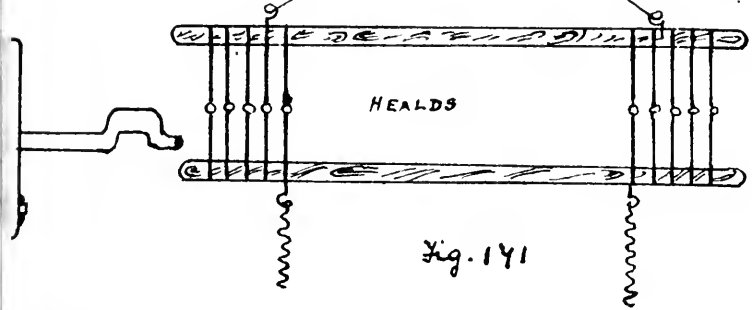



Fig. 141

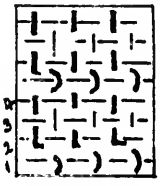


Fig. 169

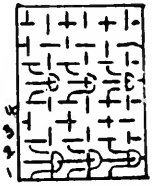


Fig. 140

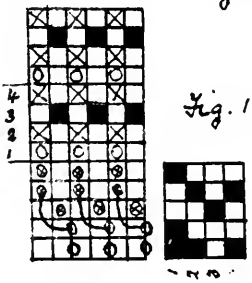
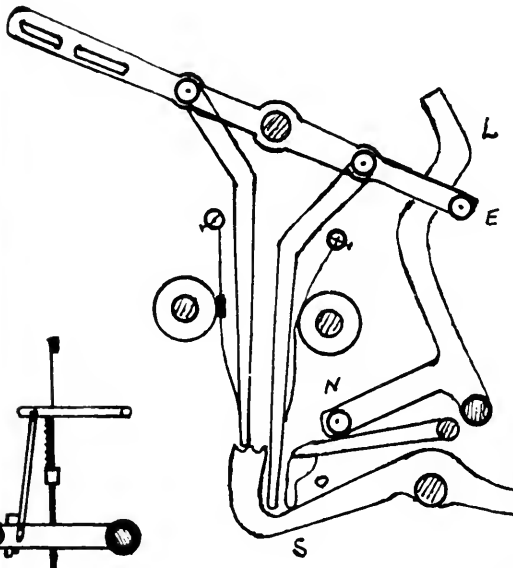


Fig. 143



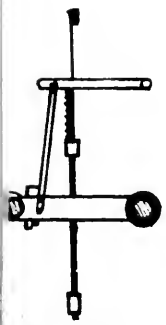
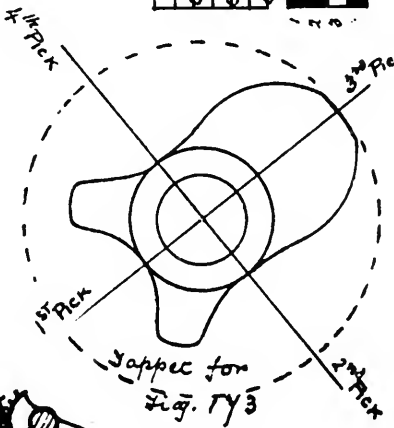



Fig. 145

Fig. 144




Tappet for
Fig. 143

PICKING. In Fustian and Velvet looms the picking takes place from the crank shaft of the loom, and not as is usually the case from the bottom shaft. The object of this arrangement is to obtain a more powerful pick; owing to the extra speed of the crank shaft, the pick is given in less time, and as the force varies as the square of the velocity, and the speeds are as 1 to 2, the force expended in throwing the shuttle is as $1^2$ is to $2^2$ or as 1 to 4. One of the earliest of these arrangements is known as the Scroll pick, and though still in use, there are others which perform the work with less mechanism, and are more simple to understand. Figs 176 and 177 illustrate YATES'S PICK, the power being obtained from the crank; the letters in each fig. refer to the same parts. Fig. 176 gives an end view and Fig. 177 a front view. A. is a heavy wheel fixed to the crank shaft at the side of the loom; B. a short stud or striker fixed to A; C. an upright iron rod, with a movable finger K at its upper end, at the lower end is a short arm D, a short leather strap E connects D with the picking stick F, which works on the fulcrum G; I. is a small tappet driven at half the speed of the crank shaft, resting upon I is the short lever J, and resting upon the free end of J is the movable finger K. When the thin side of the tappet I acts on the lever J, the finger K is in a position to be struck by the striker B. When this occurs, the upright shaft C is turned part way round, and through the connecting strap E the picking stick is pulled towards the inside of the loom, and the shuttle is thrown; the spring H then comes into action and pulls the picking stick back to the end of the box: when the thicker side of the tappet acts on J the finger K is lifted out of the way (see Fig 177) the striker misses K and no action takes place, and as this occurs on alternate picks, the picking can only take

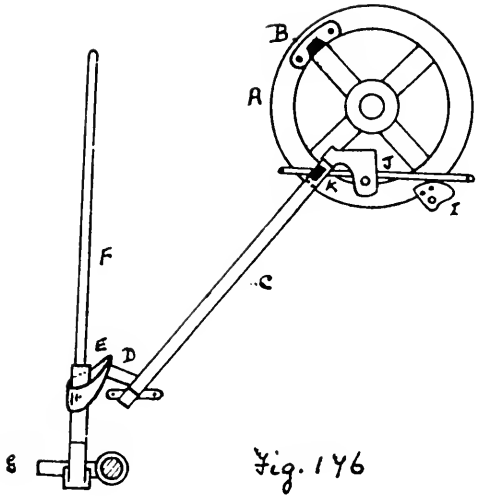



Fig. 176

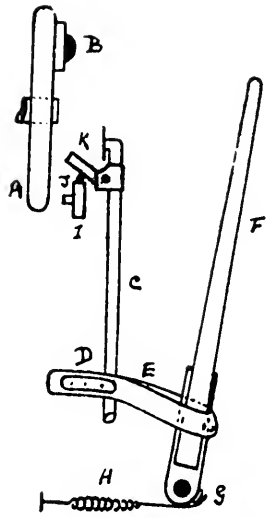
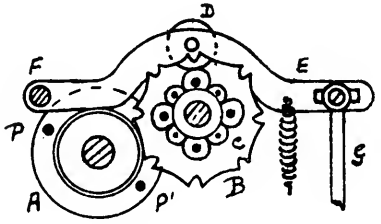



Fig. 177



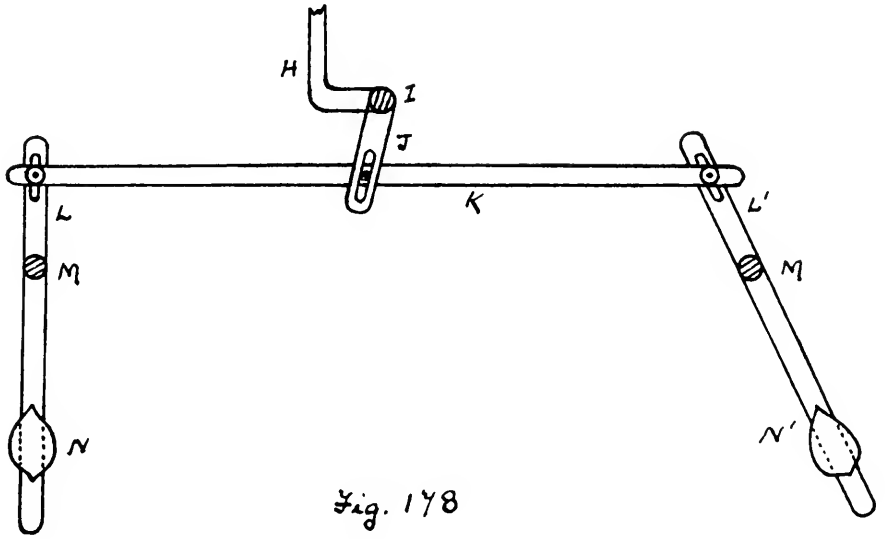




Fig. 178

55 place once every second pick from this side of the loom. There is a similar arrangement on the other side of the loom, the tappet to lift the movable finger being set for the opposite pick.

PICK AND PICK LOOMS. The looms are made with a number of boxes on each side of the loom, so that the shuttle can be changed on each pick if required, and single picks of coloured weft inserted; the picking can take place several times in succession from one side of the loom (the picking-stick on the other side remaining stationary) then several times in succession from the opposite side. An Underpick Pick and Pick motion is shown in Fig. 178 it is worked on the same principle as Diggle's drop-box motion. A. is a slide wheel fixed to the bottom shaft of the loom, the pin P or P' engage with the star wheel B on each pick; C. is a chain made up of different size links or tappets, and carried round by the barrel fixed to the star wheel B; resting on the topmost link of the chain is a bowl D fixed to lever E, with its fulcrum at F; fixed to the end of E is a rod G connected to the lever H J, with its fulcrum at I; fixed to K is a small stud which works in the slot of J. also at the ends of K are studs working in the slots of L and L'; the levers L L' are flat rods provided with iron shoes at N, they rest when in action directly on the top of the wood side lever of an ordinary underpick loom: M$^s$ are the fulcrums on which the levers work. In Fig 178 the lever to the left is now in action, and the pick will take place from this side of the loom, if a smaller link is brought into action on the next pick. G is pulled down likewise H. the rod K moves to the right, the lever L' N' is brought into action and the pick takes place from the right hand side, so that building up a chain of blanks and lifters any desired order of picking may be obtained.

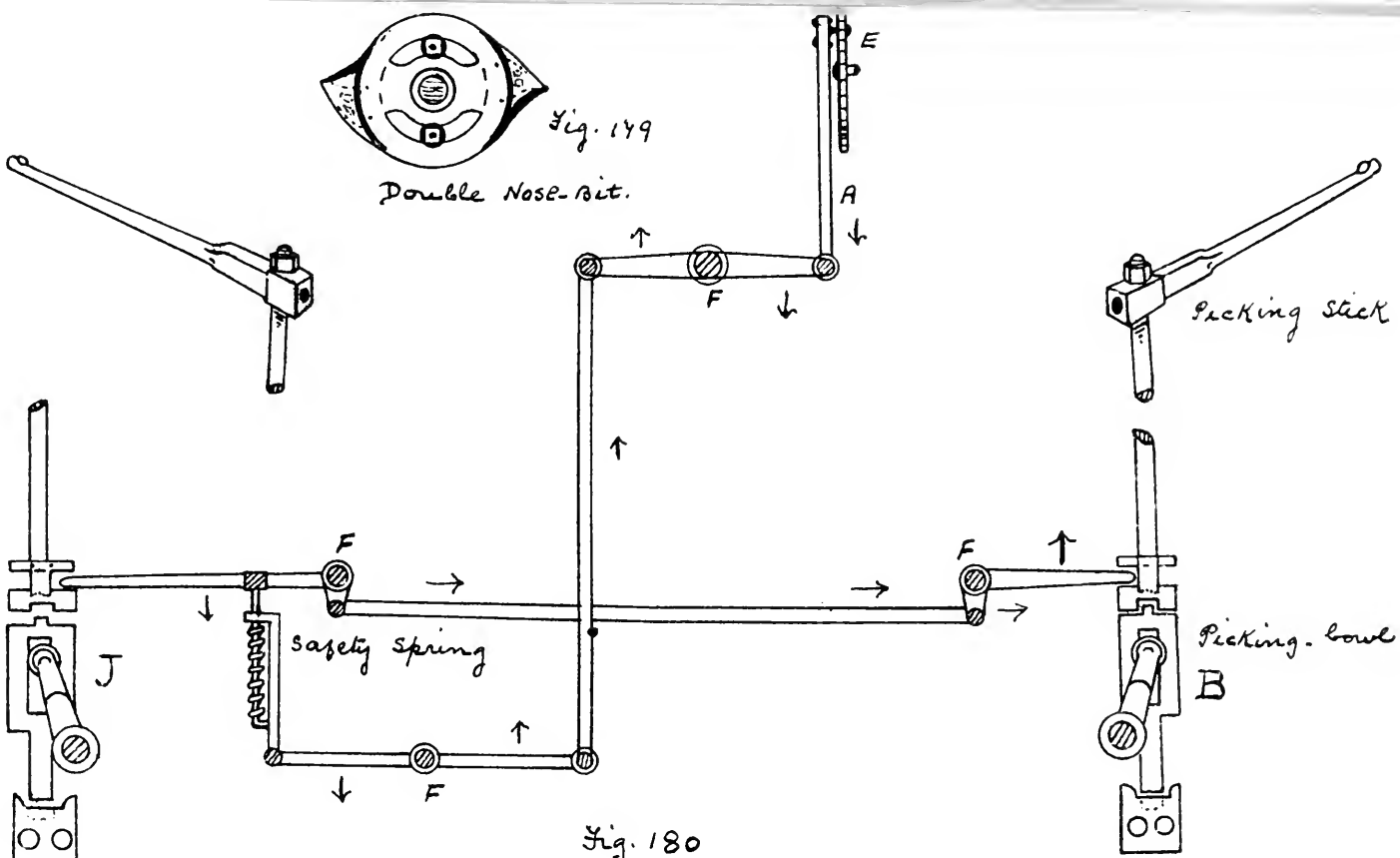



Fig. 179

Double Nose-Bit.

Fig. 180

PICK AND PICK-OVERPICK- By means of an eccentric wheel E worked by a card motion, the rod A is raised and lowered, putting the picking bowls J in and out of action. The next movement will be the lowering of A, when all the levers throughout working on fulcrums F will move in the direction as indicated by the → and putting J into action and B out of action.

Fig. 182.

Fig. 183

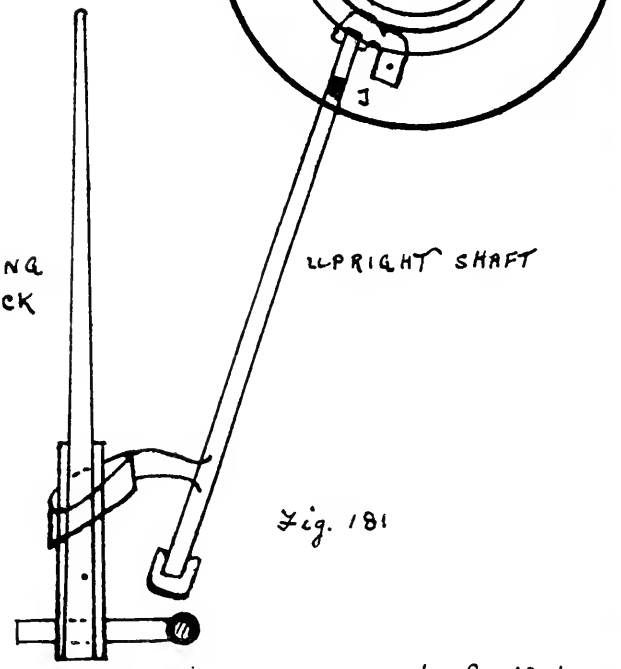
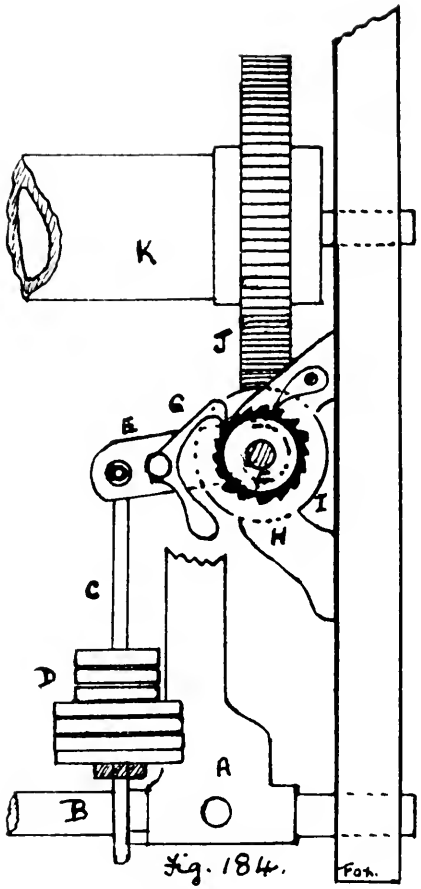



Fig. 181

THE SCROLL PICK Fig. 181 is similar in principle to Yale's pick, except that the finger on the upright shaft is a picture and the striker is movable. The striker C is fixed to a movable piece Q Fig 183 which embraces the crank shaft and is secured to the crank wheel, a metal piece P with a pin P is secured to Q. Bolted to the room side and embracing the crank shaft is a grooved plate Fig. 182 in the grooves A, B. the piece P revolves, first in the outer groove A then the inner groove B, In Fig. 181 the P is moving in the inner groove and the striker C will miss the finger J and no pick takes place, on the next revolution the P will be in the outer groove. Striker C will be moved outer into a position to strike the finger




THE NEGATIVE TAKING-UP MOTION. This motion is used in Fustians and Velvet looms; the principle of its action is illustrated in Fig 184 A. is the slay sword. to which is fixed a short bracket B; C. a rod passing through a hole in B; D. are weights secured to C: E. a short lever with its fulcrum at F; G. a pawl in gear with rack wheel H; I. a worm fixed to the same shaft as H; I. gears with the wheel J fixed to the end of the cloth roller. Its action is as follows; every time the slay sword A moves back, the bracket B is tilted up, it lifts up the rod C and the weights D, the pawl G being in gear with the rack wheel H, when the slay comes forward. B comes down, leaving rod C and weights D + fall with their own weight, and the pawl G to pull round the rack wheel H; more weight there is put on D, the easier H is pulled round and fewer picks and vice-versa

## POSITIVE LET-OFF MOTIONS.

The principle of all the motions is to connect in some way the Taking-up Motion with the letting-off of the warp. Fig. 185 illustrates a simple arrangement. The yarn from the weavers beam H is drawn between two corrugated wood rollers A. B; passed over the roller K, over the breast beam M to the sand roller F. on the ends of F and A respectively are are chain wheels G. C. Chains N. P connect A. F through the intermediate chain wheels E. D.

CENTRE WEFT FORK MOTION, illustrated in Figs. 186. 187 & 188 The motion is applied to Pick and Pick looms. Fixed to the slay in the middle of the loom, and moving too and fro along with the slay is the weft fork, a slot being cut out of the slay in which the prongs of the fork work. Fig 186 illustrates the main parts of the motion. A. = the slay; C the fulcrum for the fork; E. a grooved piece in front of the slay in which the sliding piece D works, K a rod connected to D; K passes through holes in the swivel bracket G fixed to the cross rail of the loom; F. a stop piece to prevent K passing too far through G. it also serves to push up the slide D when the ~~loom~~ slay is thrown back and the shuttle is moving across. when this occurs as it does in Fig 186 the top of D comes beneath the fork and lifts it up, the shuttle then passes through the shed, and trailing the weft behind it. the weft holds up the fork, as the beating up takes place the weft slips off the end of the fork, and the slide D falls to the bottom of the slot as shown in Fig 187 and the loom goes on weaving: if the weft is broken or absent, the fork falls down at the same time as the slide D, the curved piece on the underside of the fork holder, catches on to the curved piece at the top of the slide D and holds it up, when beating-up takes place, the projection H comes into contact with I; I. in its turn knocks the starting handle out of position as shown in Fig 188 and stops the loom.

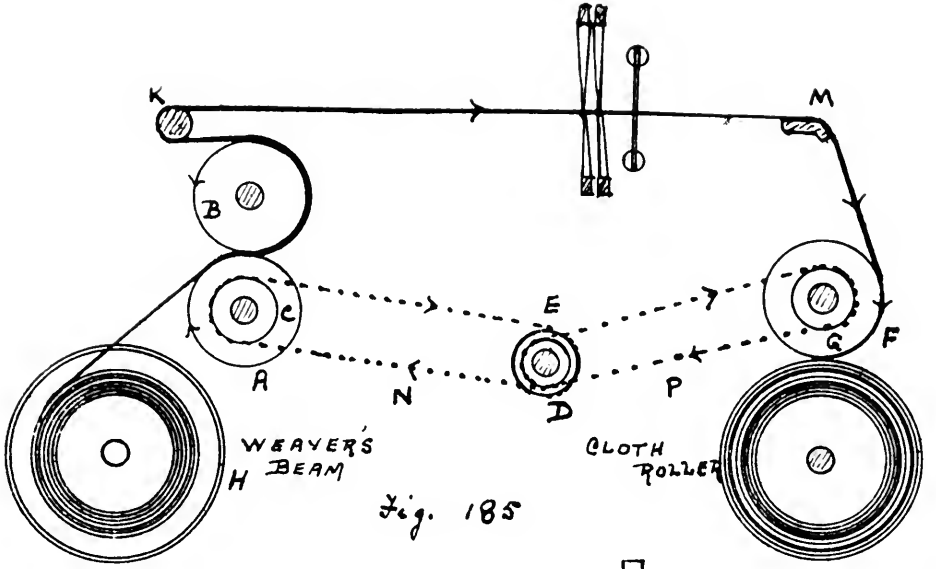
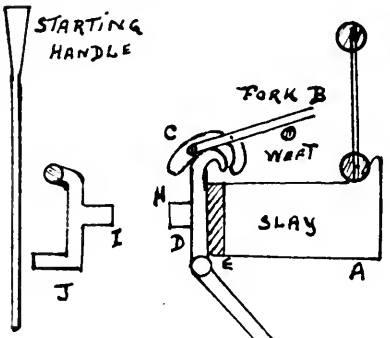



Fig. 185



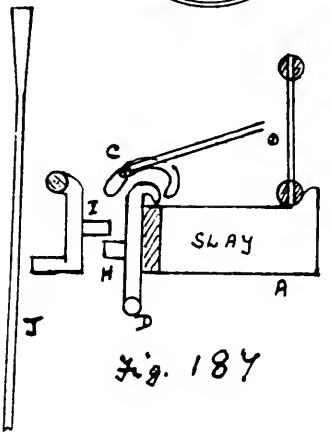




Fig. 184

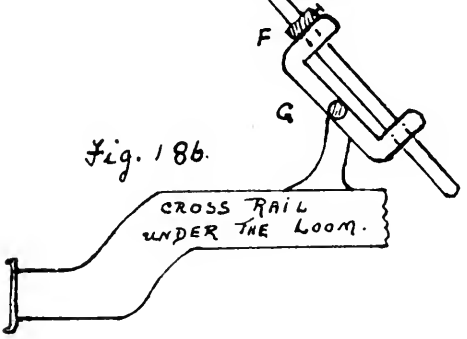



Fig. 186.

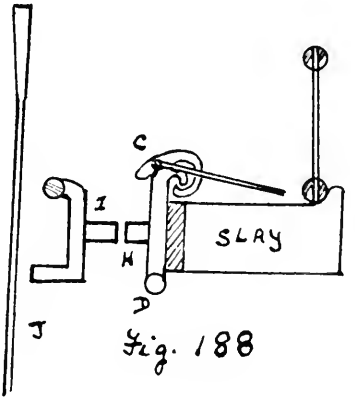



Fig. 188

DOBBIES. The advantages of using a Dobby in preference to Tappets is (1) its greater scope in producing patterns and the greater convenience in changing from one pattern to another. The principle of construction of a Dobby is, that by means of pegs inserted into a revolving lattice any heald can be selected, and raised by the machine. There are many types of these machines in common use. The single lift type as used in Hand-looms and for Lenos, and the double-lift type where a falling lot of healds helps to lift a rising lot. Fig 189 illustrates the Hattersley type — A, is a rod worked from an eccentric on the bottom shaft of the loom; it is connected to the ⊣ lever B working on the fulcrum F; attached to the arms V, V, are sliding knives D, E, resting over the knives are catches F, G, each attached to the respective end of the lever H; connected to H is the lever I with its fulcrum at J; I through the connecting link K is connected to the lever W, which lifts the healds; the barrel N carries the revolving lattice O; M, the pawl for turning the barrel; resting on the topmost lag of the lattice are a number of heavy ended levers L, double the number to what there are jacks in the machine, one half of these levers work the bottom catches G direct, the other half work the top Catches F, through a series of needles X. If a lag is in action without pegs, all the catches are lifted out of the way of the sliding knives and no healds are lifted; if all the holes in a lag are pegged, all the healds are lifted, so that it is easy to understand that if the pegs are inserted in the lattice in definite order to suit a pattern, the healds will be lifted in that order, and the woven pattern designed for, will be the result.

THE BURNLEY DOBBY — is illustrated in Fig. 190 the working is very simple and direct in its action — A, is a top lever connected by a rod to an eccentric fixed on the bottom shaft of the loom; B and C are two hanging levers, the free ends resting in a position over the lifting lever D, so that they can come into contact with

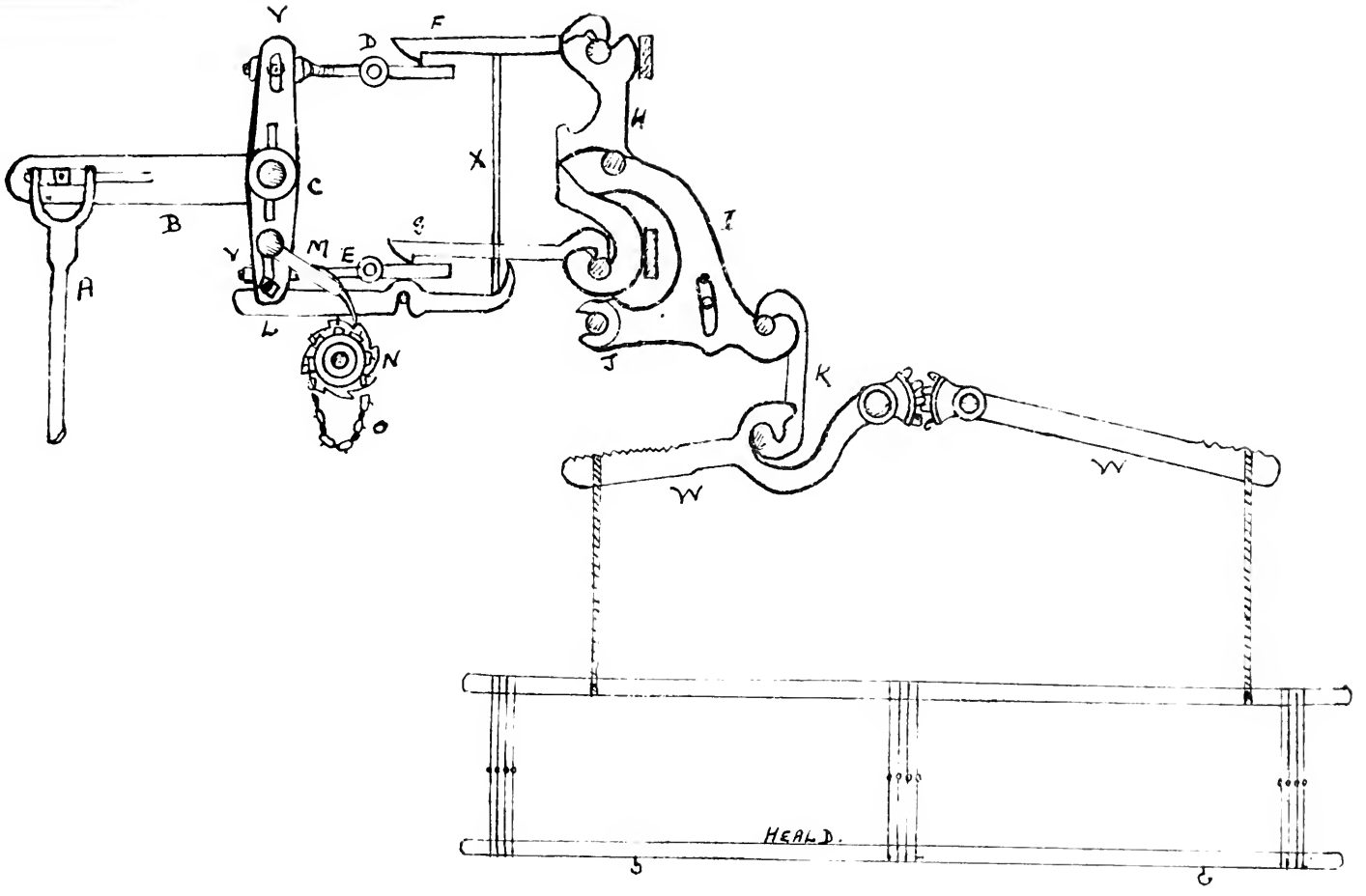



Fig. 189.

it, or miss it when desired: H and H' are two revolving barrels, the star wheels preventing one barrel from getting before the other, so that when the lattice is put up, it is impossible for them to get out of time with each other. When a bar is in action with a peg opposite to a lever as in H, the lever B through a small flat spring is pushed back so that the end comes direct over D, when A comes down B does the same pushing down D, and working on the fulcrum V, E² goes up, taking up the connecting link F, and at the same time levers G. G, and lifting the heald.

This machine is specially adapted for Leno Weaving, the parts marked L.E.N.O.S. are added for that purpose; the object aimed at is to lift all crossed ends to a middle position when a doup crossing takes place, this done by fixing a small bowl S to the end of lever A, this bowl passes the elbow of lever O every pick forcing it back, a bowl N at the other end of the lever O passed down the lever E, the free end of which carries a bar, to which pieces L are fixed over those heads which are required to have a half lift.

THE KNOWLES'S OPEN SHED, AND POSITIVE DOBBY. Fig. 141 In this dobby there are two rollers A, B, about 4" dia. extending the width of the barrel, say about 10" wide. These rollers are situated one under and one over a series of thin movable wheels C, one wheel for one jack. These wheels are set with teeth all the way round, except a space of ½" of the circumference which is blank; C is connected by a arm D to the jack lever E and also to the lever F which is controlled by the bowls and blank (plate) in the lattice. The working of the heald depends upon the movement of the wheel C, as to whether it leaves the arm D which is attached to it in the position shown or whether it brings it round to the other side as indicated by the dotted line; at the instant time the wheel C is in such a position that the heald is down, and that part of the wheel C which is in contact with B contains no teeth, so that the revolving wheel B can

communicate no motion to C; the next possible movement of the heald will be due to a peg lifting the lever F and wheel C so as to enable it to gear with the wheel A, and so bring lever D to the position of the dotted line and lift the heald.

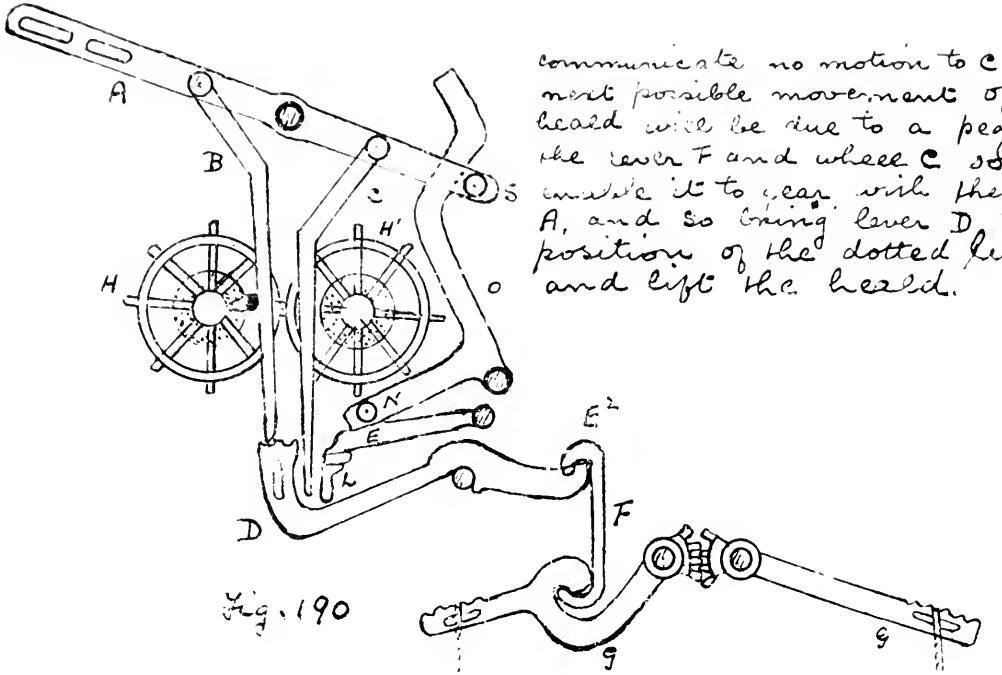



Fig. 190

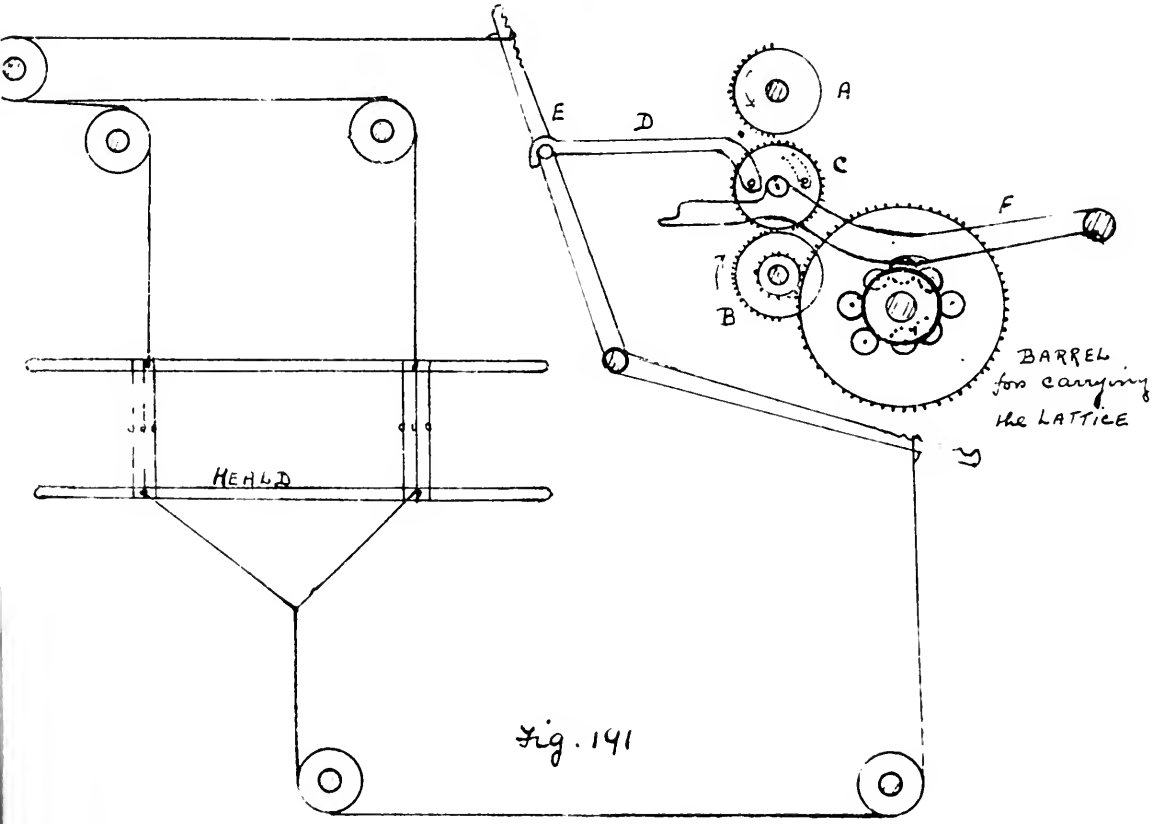



Fig. 141

THE BLACKBURN DOBBY. Fig. 192 In this machine the lifting Knives A. B have a vertical motion imparted to them, by means of a pair of tappets fixed on the bottom shaft of the loom, connections being made with the Knives through rods and levers. Hooks C. D. made from strong spring wire are attached to the lifting jacks D. two hooks to each jack: two pattern cylinders E. F are used, the odd picks are pegged on one cylinder the even picks on the other, the cylinders receive a horizontal as well as a rotary motion; in the sketch the lag on cylinder F is acting on hook C and the peg has pushed the hook C off the Knife A; during the time the Knife A is being lifted the cylinder F moves back, and the cylinder E moves horizontally forward towards the hook D ready to act upon it when Knife B comes to the bottom. A blank indicates a heald up: a peg indicates a heald down.

CROSS BORDER MOTION - Hupton & Place. Fig 193 The measuring motion consists of a short lattice A, carried by the cylinder A'; A' receives its rotary motion from the arm D, which is worked by the last jack of the dobby; the pegs on A raise the lever B, and with it the short swing lever B'; on B' are two notches, into one or the other of these a Slide B'' engages when a change of the pattern is required, B'' being fixed to the ⊢ lever of the dobby. The arm C and the Barrel swing lever work on the fulcrum E. Method of Working - Suppose that lattice 1 is required to repeat 10 times before changing to lattice 2, and after that the lattice 2 is required to go only once round and change again to lattice 1. Then for ten repeats of lattice 1 and the once round of lattice 2 the auxiliary lattice A' will be made up of ten lags without pegs and one lag with a peg in; or a lag without a peg for every repeat of lattice 1 and a lag with a peg for every repeat of lattice 2

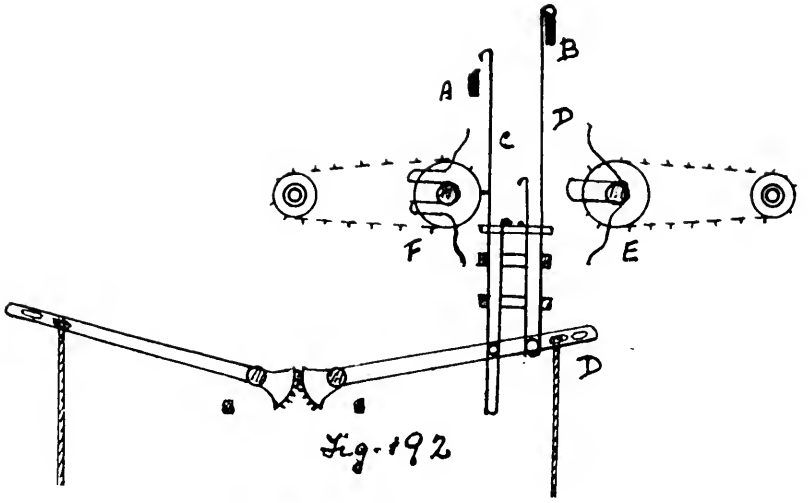



Fig. 192

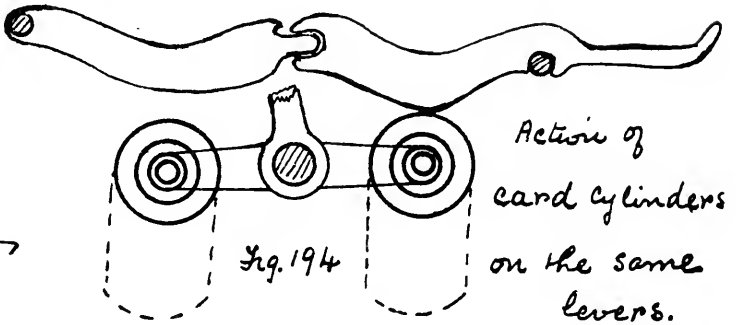


Fig. 194

Action of card cylinders on the same levers.

in Lupton & Place cross Border Dobby.

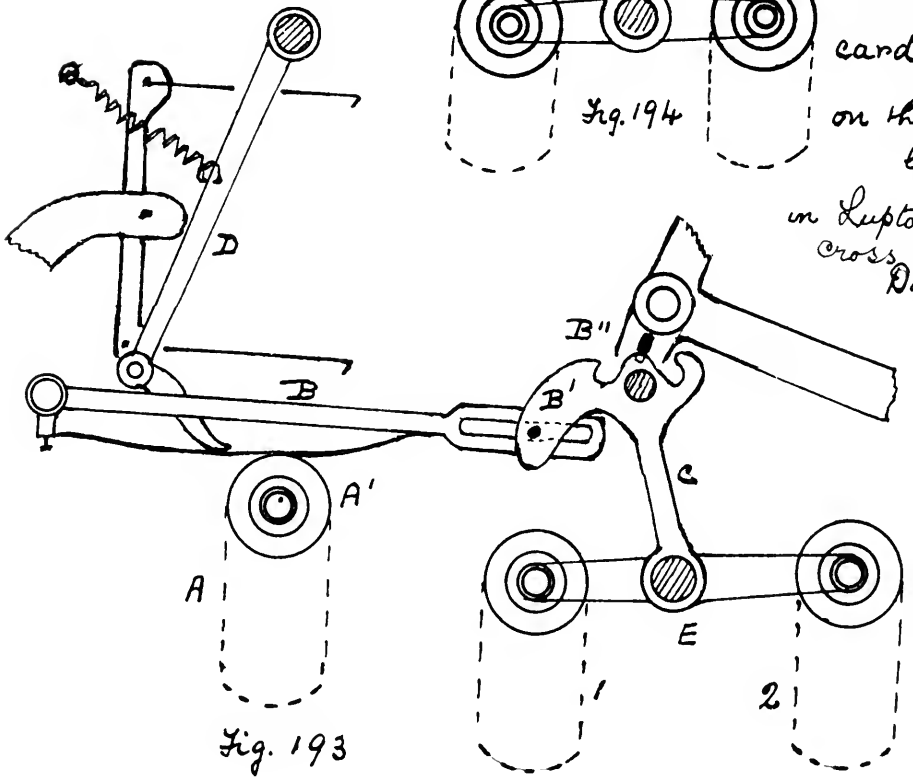



Fig. 193

CIRCULAR BOX-LOOM. Fig 195 illustrates the principle of working in a circular box loom. Fixed to one end of the slay is a circular box S, consisting of six chambers for six seperate shuttles; fixed to the box end is a plate B provided with six short pins, two upright catches C and D are placed, one on each side, the ends are fixed to two levers E and F respectively, both these levers have a common fulcrum G, at the other end of these levers are upright catch H, one for C and one for D; (only one is shown) in close contact with the upper part of H is the free end of the lever I with its fulcrum at J, at the other end of I and fixed to it is a pin K which rests on the top card of a series of flat steel cards carried by the barrel or cylinder L; a pawl M on the lever engages with the cylinder L and rotates it. On the bottom shaft of the loom is a tappet N which lifts the lever O once every two picks. The other tappet Q lifts the upright rod R and through the connection shown the lever I.
The change in the boxes is brought about by cards perforated or left blank to suit the pattern; these cards are laced together and are passed each in their turn over the cylinder L. Assuming that there is a hole in the card over which the pin K is resting, the pin will fall through and that end of the lever lowered, working on the fulcrum J the other end comes into contact with H and pushes it over the edge of a short stud fixed to O, as O being lifted by the tappet, H is also lifted, assuming H to be connected to C, the boxes will be turned to the left. If the pin belonging to the other lever drops through a hole in a card, D is pulled down, and the boxes turn to the right. Catches W W' lock the box. X. Y. Z prevent breakages in event the boxes cannot turn. Lever V is connected to the finger, and stops the card cylinder when the weft breaks.

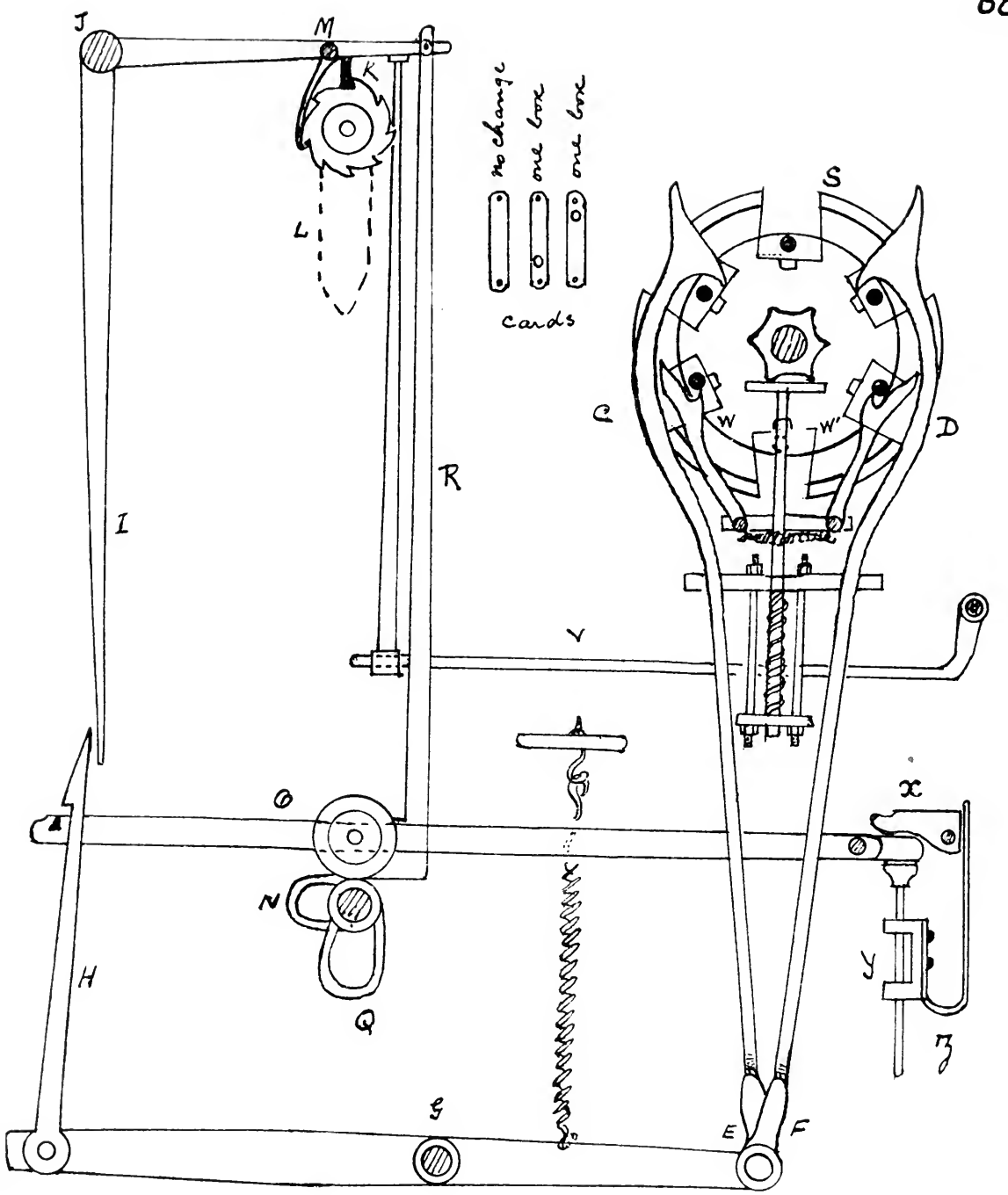



Fig. 195

CIRCULAR SKIP-BOX LOOM. When it is desired to move the shuttle boxes through more than one box at a time, Circular Skip-box motions or Skip drop-box motions must be used. Figs 196. 197. 198 and 199 illustrate the mechanism of a Circular Skip-box motion.

Referring to Fig. 196 fixed to the circular box end A is a wheel B, embracing B is a toothed rack C fixed to the upright rod D; D is attached to the end of the lever E with its fulcrum at F; at the other end of F is the upright catch G; resting against the top of G is end of the bell crank lever H.I.J, with its fulcrum at I, at the end J is a pin which rests on the top card of a series of flat steel cards carried by the pattern cylinder K. Fixed on the bottom shaft of the loom L. are a series of tappets M, these tappets as they revolve lift a series of levers N; a series of three tappets of different sizes are used for operating the lever O Fig. 19 for pulling down the rack C and determining the distance through which the box shall turn, the smallest tappet being for one box, and the largest tappet for three boxes. The lever P (see Figs 194 and 198 unlocks the box, and allows it to turn freely. Q and R (See Figs 194 and 199) determines which side of the rack shall gear with the wheel B and consequently determines the direction in which the box shall move.

The levers N work freely on the fulcrum T, but in event that the shuttle is caught half way in the box at the time of change, the strong spring U gives way and allows the piece V to rise up, and the lever N to be lifted from the end W

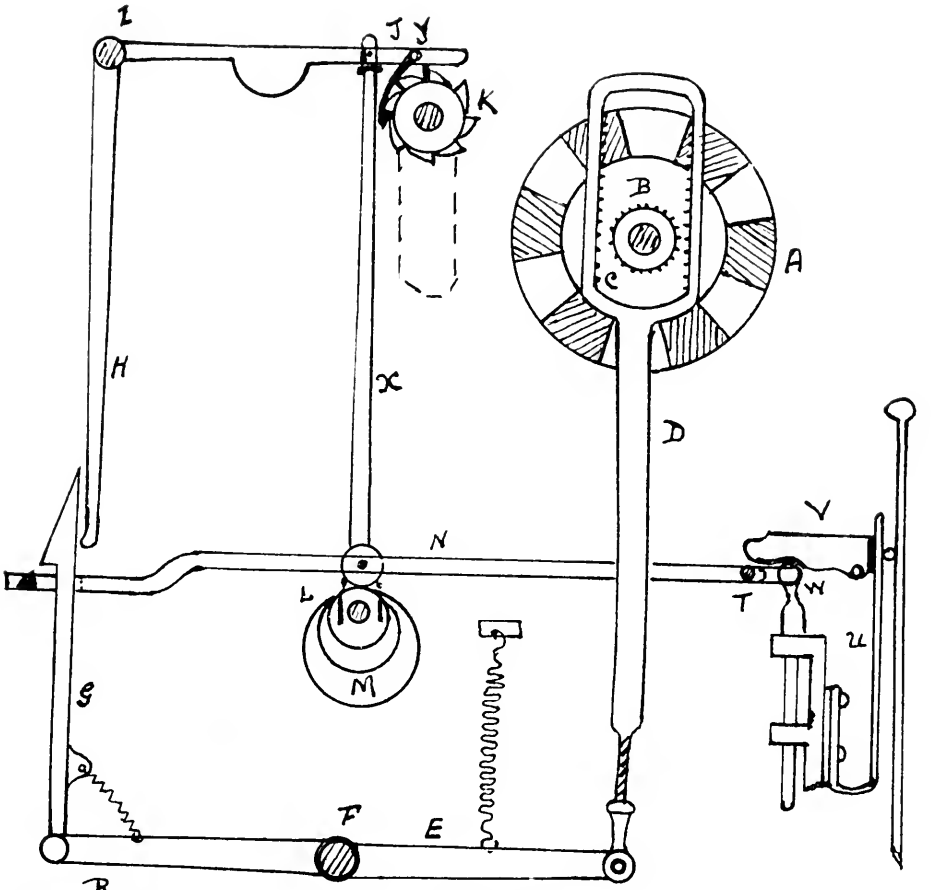
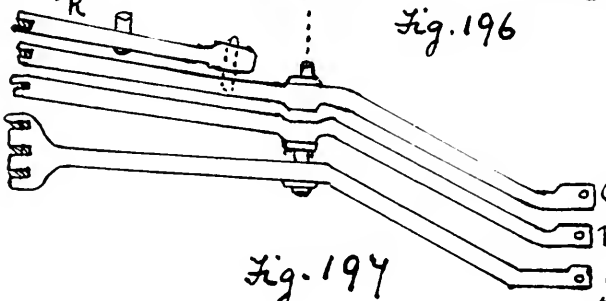



Fig. 196




Q. direction of boxes.
P. unlocks the boxes.
O. number of boxes to be moved.

Fig. 194

A seperate tappet is used for lifting the rod x, which lifts the lever J, and also through the catch Y turns the barrel Z which carries the pattern cards.

The lifting of Y pushes the starting handle out of position and stops the loom.

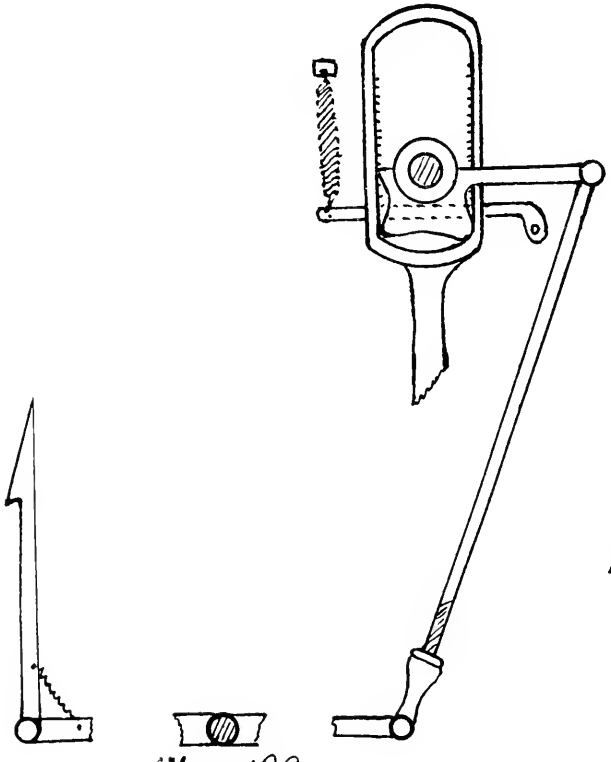


Fig. 199

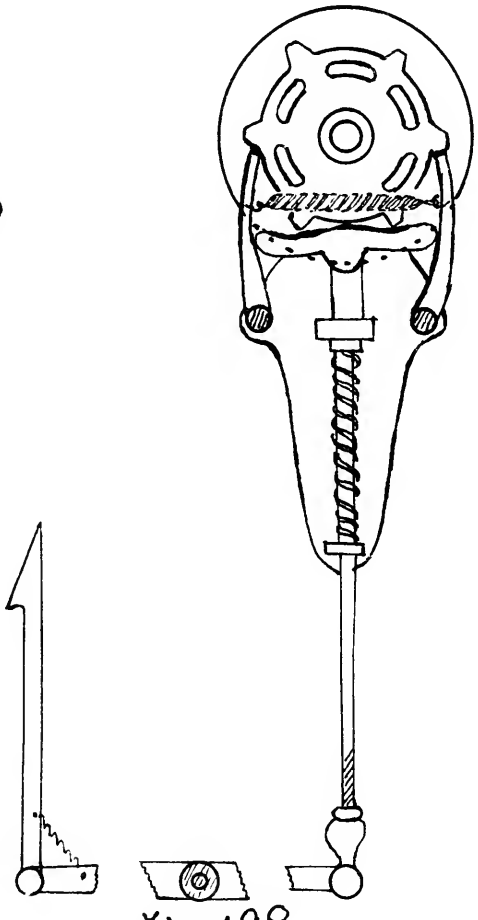


Fig. 198

WHITESMITH'S DROP-BOX MOTION Fig. 200. The principle of working of this motion is based on a double excentric, one enclosed within the other, the throw of the outer one gives two boxes, the throw of the inner one, one box. In Fig. 200 the outer excentric A is connected to the rod C by a pin B; at the top of C are the boxes, four in number. The outer and inner excentrics can be worked seperately by the two wheels E and F Fig 201. On the bottom shaft H of the loom is a crank I which moves catch J backward and forward; J engages with the pins on wheel G when a change is required and turns one or the other of the excentrics. Crank I also, moves K backward and forward and working on the fulcrum L moves the card cylinder N up and down, a blank in the card lifts lever O, and through the link P lifts Q and lowers R and S and allows catch J to engage with G and bring about a change. There are two catches J and two wheels G, to work the inner & outer excentrics respectively. (See Fig. 201)

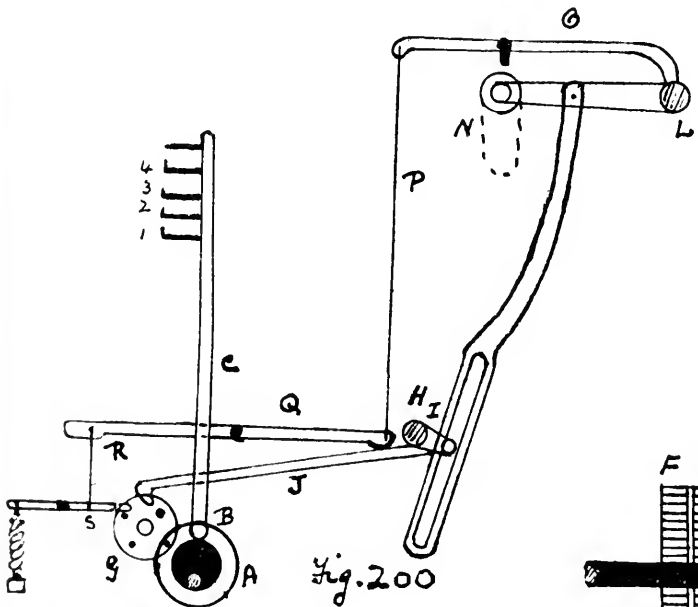


Fig. 200

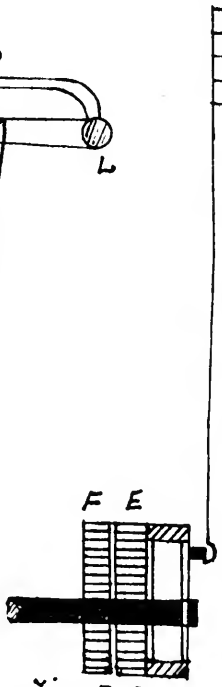


Fig. 201

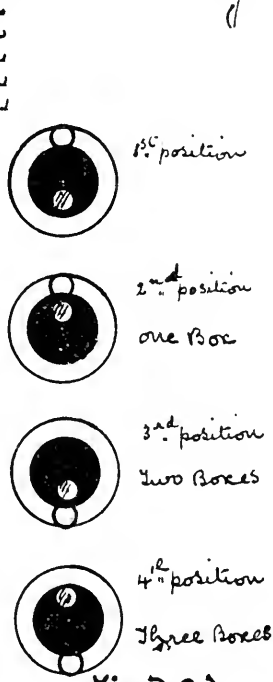


Fig. 202

DROP SKIP-BOX MOTION. Cowburn and Pecks Fig 203

This is a positive drop-box motion capable of moving the boxes from 1 to 2; 1 to 3; or 1 to 4; it is worked on the principle of a double excentric and a crank. Fig 203 illustrates the principle parts of the motion; A, is the bottom shaft of the loom; B, a tappet fixed to A; C D, a short arm fixed to B; E, a rod connected to C D, the other end of which is fixed to the upright rack F, it is also connected with the lever G, with its fulcrum at H; at the other end of H is a short arm B provided with a pin or stud which engages with the notches in the star wheel I and turns the card cylinder J; K is a small pinion fixed to one of two discs; W, a catch which engages with the notches in the disc when the boxes are stationary; M, a rod connected with the discs; the lever O and the upright rod P connect M with the boxes. There are three needles or feelers Q situated one behind the other, one for each of two upright racks F, and one for the catch W. The tappet B moves the cylinder J to the needles Q once every two picks, if there are perforations in the card for the points of the three needles to pass through, the racks F fall away from the pinion by their own weight and no change takes place, but if there are two blanks and one perforation, the catch W will be lifted by one of the needles forcing it back, F will be pressed into gear with pinion K by another of the needles, then the downward movement of the arm C D due to the revolving of A will bring down the rod E and the rack F which turns the disc R, bringing down the rod M and lifting the boxes. Fig. 204 shows an end view of the discs and rod M, when the disc A is turned by the pinion C, M is lowered to the extent of two boxes; when B is turned by pinion D, the rod M is lowered to the extent of one box. Fig 205 and 206 give end views of the two discs.

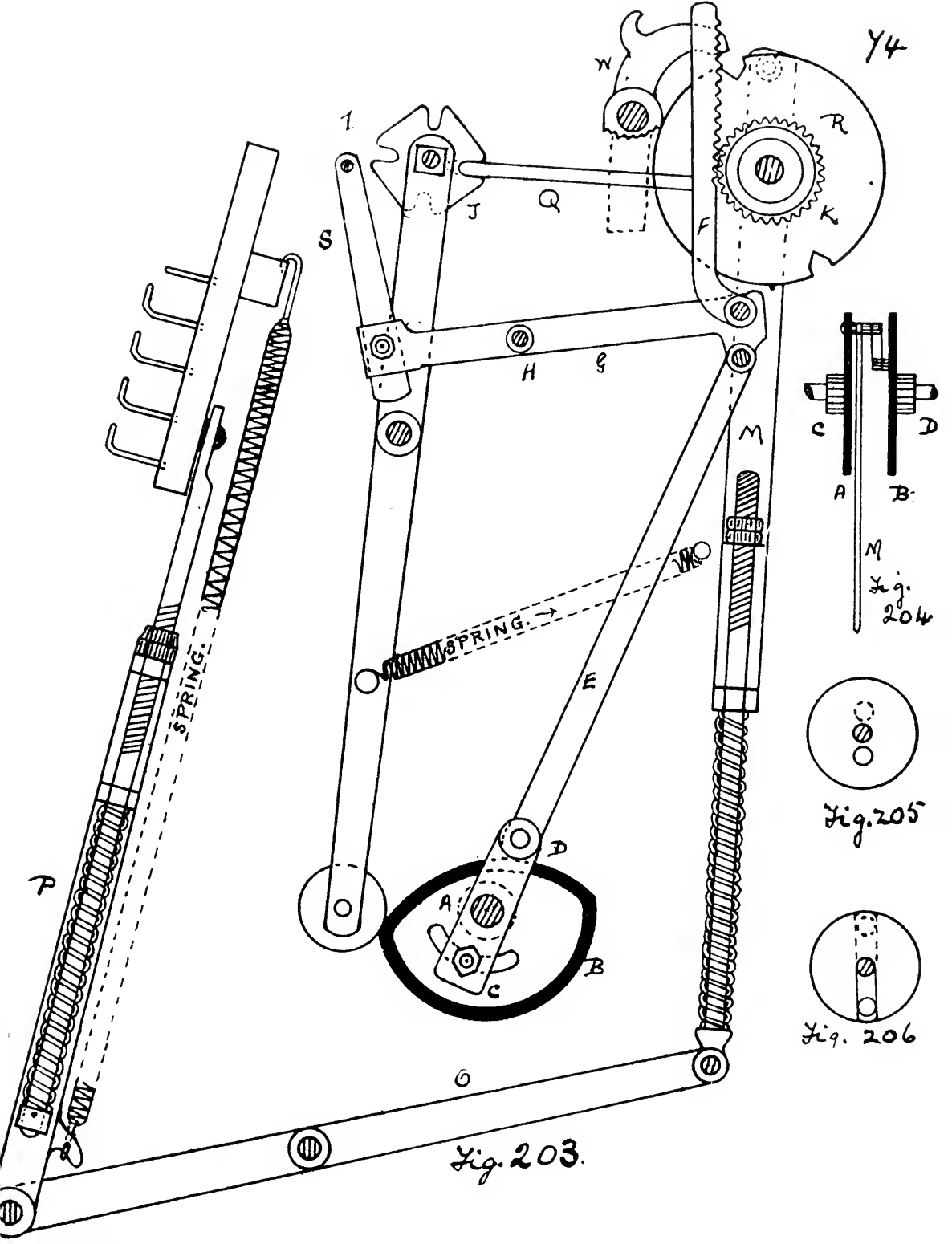



Fig. 203.




Fig. 204



Fig. 205



Fig. 206

DROP SKIP-BOX MOTION - Wright shows - Fig 208 This motion is worked from two different size of tappets, on the bottom shaft of the loom, either of which can be put into gear to lift the lever E and bring about a change in the boxes of 1 to 2 or 1 to 3. Fixed to the end of the bottom shaft of the loom is a tappet A; resting on A is the bowl D fixed to the lever E, the fulcrum of this lever is F; at the other end of E is a forked rack G, between the prongs of the fork is the pinion H. on the same stud as H and situated just behind it is a similiar wheel to H, which is in gear with the upright rack I, which in its turn support the shuttle-boxes L; C is another, but larger tappet carried by the bottom shaft, it is under the control of the forked lever B, and is capable of a sliding movement along the shaft; also on the bottom shaft and situated under the loom is another tappet as shown by the dotted lines, this tappet works the lever X (shown also in dotted outline), the other end Y carries the card cylinder T, a strap and weight W keep the lever in contact with the tappet

The rising and falling of the boxes is effected positively and is brought about by means of the tappets A and C; the lifting lever E; and thin metal cards. A plan of the three feelers which bring about the change is shown in Fig. 209 the feelers or rods N. O. P. are for the purpose of determining how the boxes shall rise or fall; the pushing back of N puts the prong R into gear with the pinion H, and on the upward movement of the forked rack, the boxes move downward; when P is pushed back S is put into gear with H and the boxes move upwaid. O controls the position of the larger tappet, when O is pushed back it causes the fork B to push the larger tappet along the shaft and cover the smaller tappet so that the lever E is lifted to the extent of two boxes.

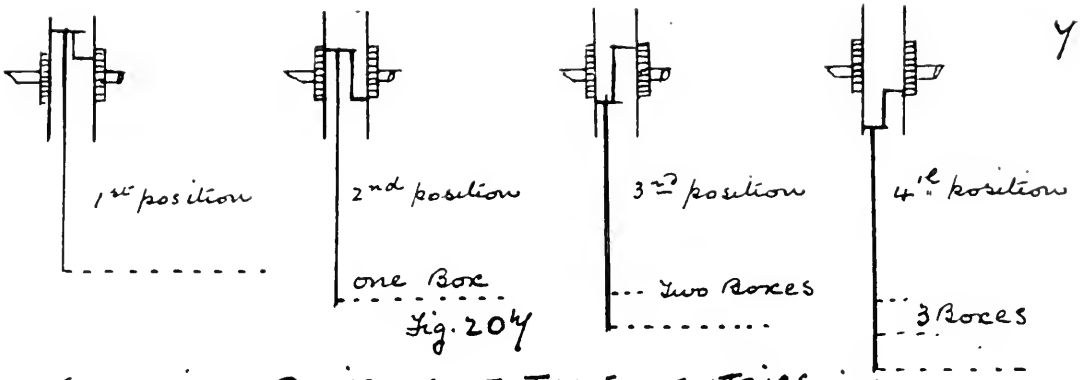
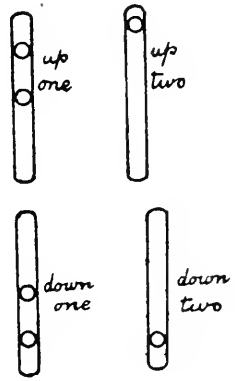



Fig. 204

THE VARIOUS POSITIONS OF THE ECCENTRICS IN CONBURN OR PECKS DROP SKIP-BOX MOTION.




Fig. 209




CARDS FOR WRIGHT SHAWS DROP-BOX

Fig. 210

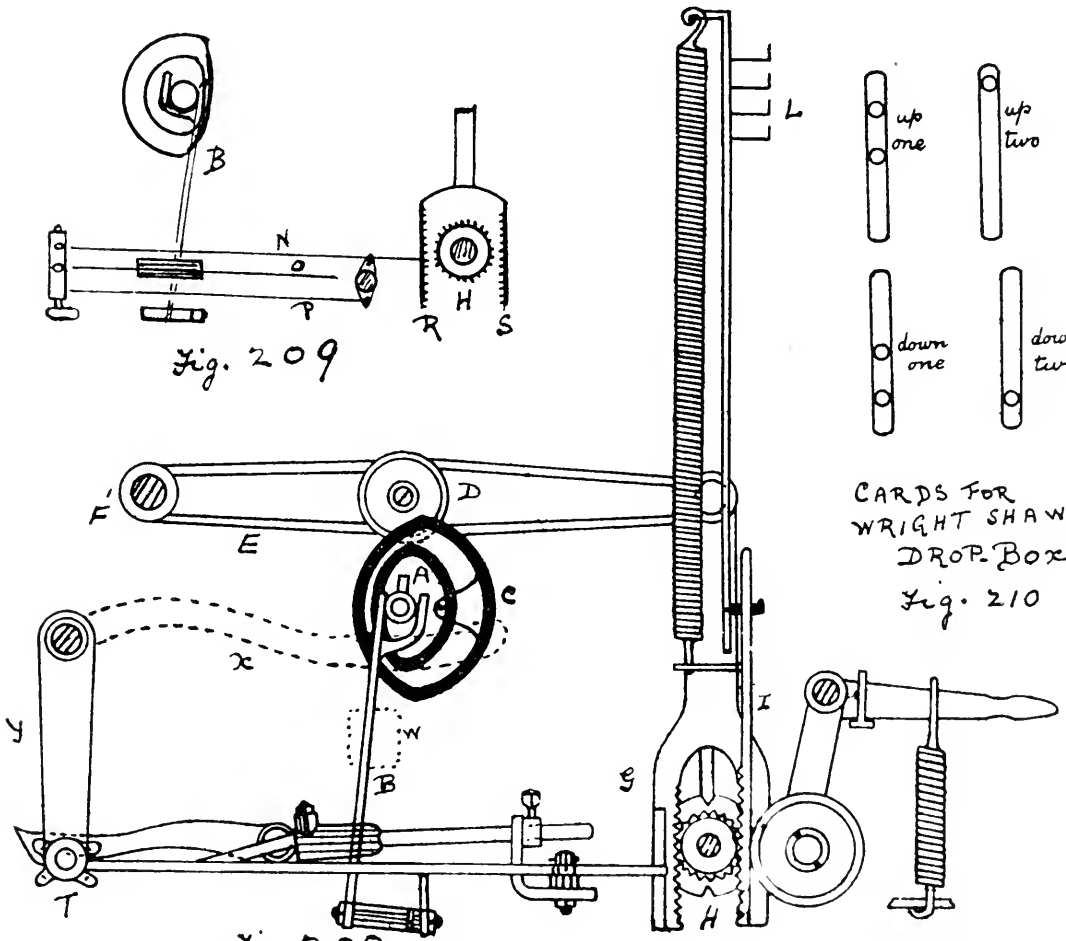



Fig. 208

DROP SKIP-BOXES. Knowles's Chain. Fig. 211.

In this motion one box can be moved at a time, or a box can be skipped as desired. Two segment toothed wheels A. B. are driven by means of an upright shaft and bevel wheels, from the bottom shaft of the loom. The movable wheel C is under the control of a lever D and a pattern chain I; the pin F (fixed to C) connects G with the lever H, and H is connected with a chain I to the shuttle boxes. Another movable wheel situated behind C is connected through J to the lever K; to the other end of K is fixed a pulley L, over which the chain from the boxes pass. By moving the levers H. & K in and out, through the connections G and J, and the pins on the movable wheels, any desired change of the boxes may be obtained; this is illustrated by diagrams Figs 212. 213. 214 and 215, assuming the top box to be no. 4 and the bottom box no 1. the following changes take place — when both pins are to the right of the centre of the wheels Fig. 212. no 4 box is on a line with the picker when pin F moves to the right Fig. 213, no. 3 box is on a line with the picker. when pin M moves to the right (and pin F to its first position) Fig 214. the bowl L moves outward and takes up twice the length of chain and brings no. 2 box on a line with the picker. when both pins F and M are moved to the re. left of the centre pin Fig. 215. no. 1 box is on a line with the picker.

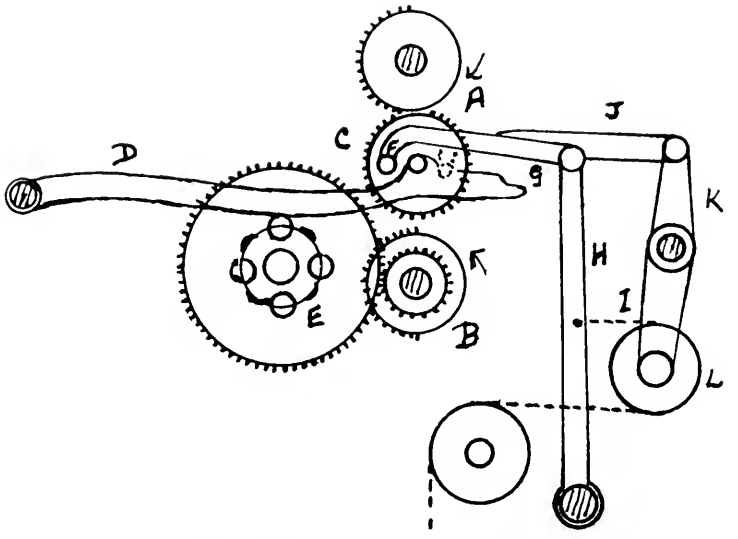



Fig. 211

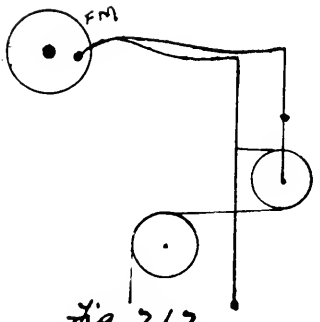



Fig. 212

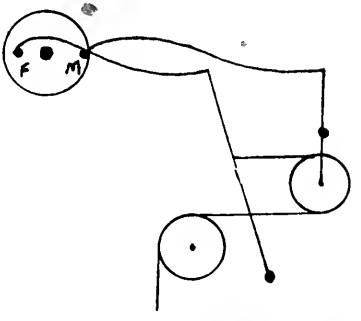



Fig. 213

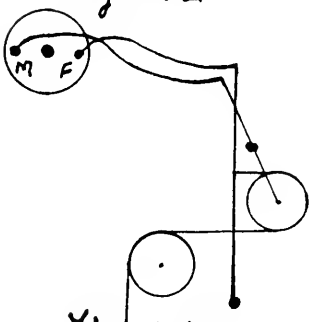



Fig. 214

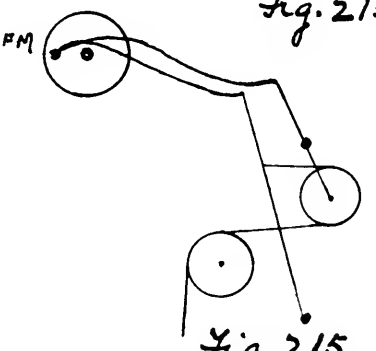



Fig. 215

THE KNOWLES LOOM. Many attempts have been made to place the "shedding", "box motions" and "picking" under the control of the same mechanism, so that in the event of any turning back to find the broken pick, the "box motion and picking are turned back at the same time. In this loom the "shedding", box motion and picking are under the control of the same mechanism. In Fig 216 the upright shaft D is driven through a train of wheels E.F.G.H from the bottom shaft of the loom; fixed on D are bevel wheels I. J which drive the toothed segment wheels A. B; the movable wheels C are placed between A and B. and can gear with either one or the other of them. (see also Fig. 211) 16 wheels (c) are set apart for working the heads. 4 wheels (c) are for the box motions, and 1 wheel (c) for the picking. The wheel K on the end of the bottom toothed segment B. drives a wheel L which is fixed on the end of the pattern barrel for carrying the lattice. In the event of turning back, the lever M.N lifts a clutch P out of gear, which leaves the shaft D free to turn round; the handle Q is then used for reversing the dobby, the turning back of which turns back the lattice, and simultaneously the "boxes" and "picking", so that when the broken pick is found, the "boxes" and "picking" will also be in their proper order.

PICK and PICK MOTION. Fig. 214. This motion is applied to an underpick loom; the principle of its construction is that the strikers E "in" and "out" of the way of the side lever. The movement of the pin in the wheel C from F to G and G to F bring about the required changes.

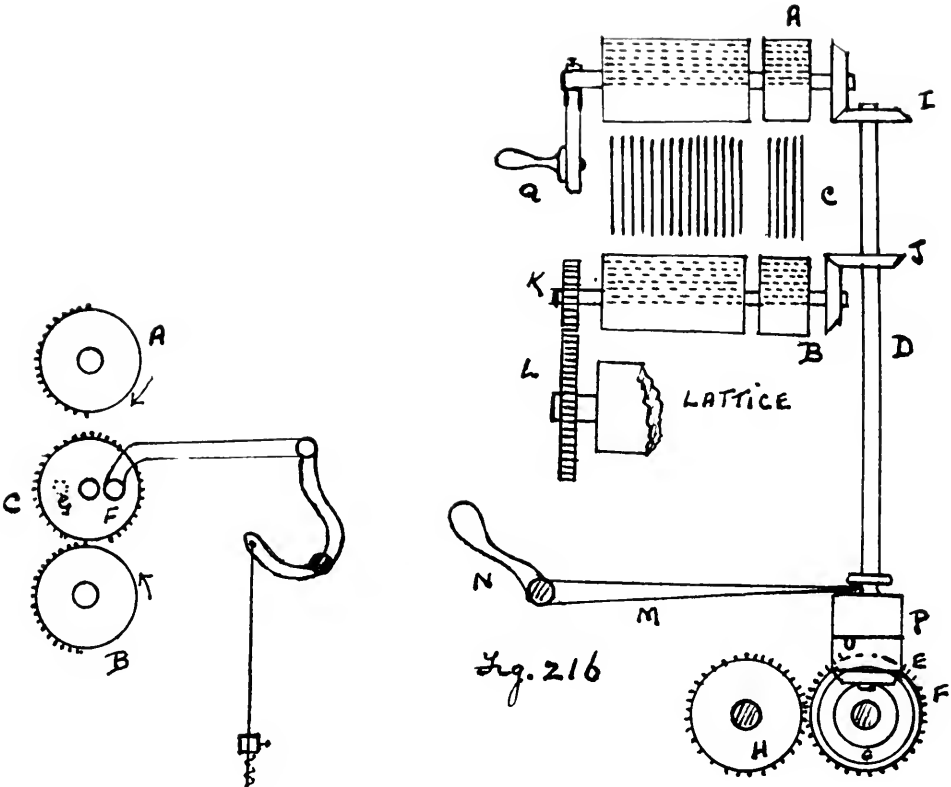



Fig. 216



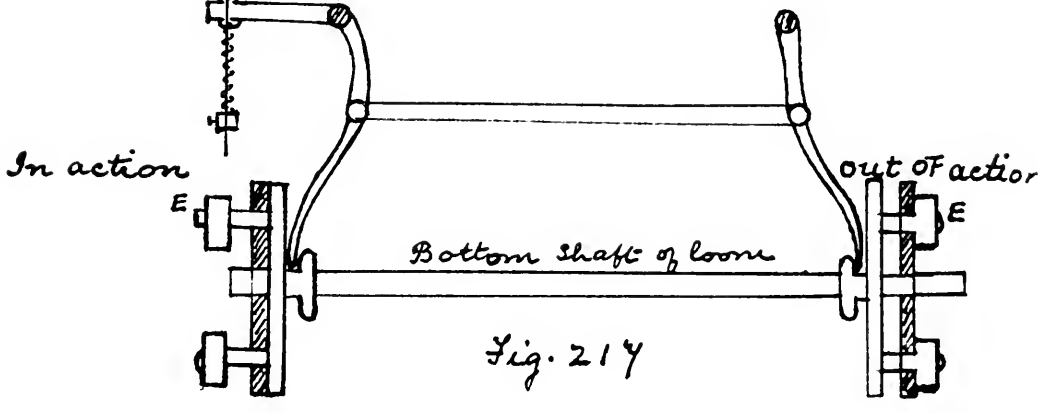




Fig. 214

CROSS-BORDER HANDKERCHEIF MOTION- Fig 218.

This motion is applied to the circular Skip-box as described in Fig. 194 and page 69. The following additional parts are added. 1. 2. 3. 4. 5. 6. 7. 8. 9 and in addition two cylinders are used Fig. 219 one cylinder for the cards for the body of the cloth, the other cylinder for the cards for the cross-border. The levers A.B. one from each cylinder are for the purpose of turning the cylinder 8, this cylinder carries a pegged lattice, a peg lifts the lever 4 and through the connections 6. 5 & 4 pushes the rod 3 forward, which is the means of putting the pawl into gear for turning the cylinder B: a blank on 8 lowers lever 4, and through the connections shown pulls the rod 3 backward. This action takes the pawl out of gear with cylinder B, and at the same time puts the pawl in gear with A. (there being two seperate pawls for the purpose) so that blanks and pegs on the cylinder 8 determines which of the two cylinders A or B shall be working, by this means one cylinder can be kept in action for any number of picks, then changed on to the other cylinder as desired. Assuming that there are 40 picks to the round on cylinder A, and it is desired to repeat the pattern 8 times before changing; 20 cards will be put together for the pattern (two picks to one card), one card out of the whole repeat will be cut for lever 1, therefore once every repeat, cylinder 8 will be turned, and as no change is required for 8 repeats, 7 lags on cylinder 8 will be blank, but when cylinder 8 is turned for the 8th repeat, a lag with a peg will be brought under lever 4, and the cylinder A thrown out of action and the

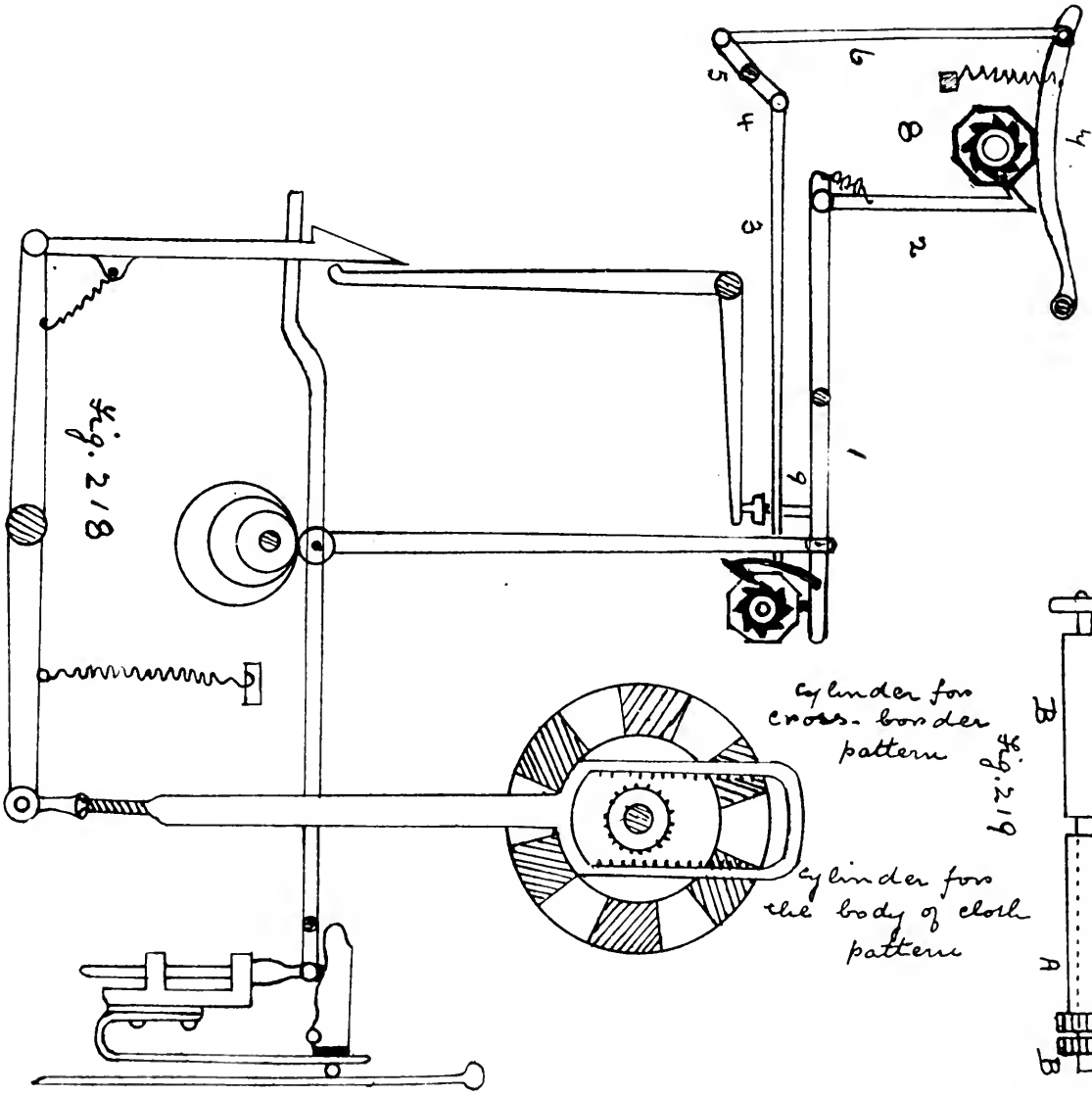


Fig. 218
Fig. 219
cylinder for cross-border pattern
cylinder for the body of cloth pattern
Levers for changing the boxes
B. Change lever
D. Change lever.
Levers for changing the boxes
A
B
A
B

Cylinder B put into action; if 4 repeats are required on Cylinder B three lags on cylinder 8 are pegged and the 4th left blank. the blank card puts cylinder A into action on cylinder B out of action

DIGGLES DROP-BOX. "card saving attachment" Figs 220 and 220a. In Diggles Drop box Fig. 220. a chain made up of different size small tappets are linked together and pass over an intermittent revolving cylinder A. these tappets lift a lever B. the motion of which is conveyed to the boxes C. which fall with their own weight when the tappet ceases to act. The star wheel D is fixed on the end of the cylinder A and receives its motion from the wheel E which is provided with two pins which engage with the notches in wheel D. The card saving attachment consists of an arrangement Fig 220a for withdrawing the pins and allowing a tappet to remain in action for any number of picks: for that purpose another cylinder F is used, this cylinder carries a lattice of blanks and pegs; blanks allow the pins G to turn the cylinder: pegs lift H and withdraw the pins and stop the cylinder A.

COWBURN and PECK'S. "card Saver" and "Reversing motion" Figs 221 and 221a This attachment is applied to the Box motion Fig. 203. An extra cylinder A is added, which carries a lattice of blanks and pegs; two star wheels B and C are used for turning the ordinary card cylinder D; by means of the pegs and blanks acting on the bell crank lever H F. the turning pins can gear with B or C, in the sketch pin G is turning cylinder D; a peg on A will put E into action with C and reverse the motion of the cylinder D. A slightly thicker lag on A puts both pins out of action with B and C and allows a card on D to act for any number of picks.

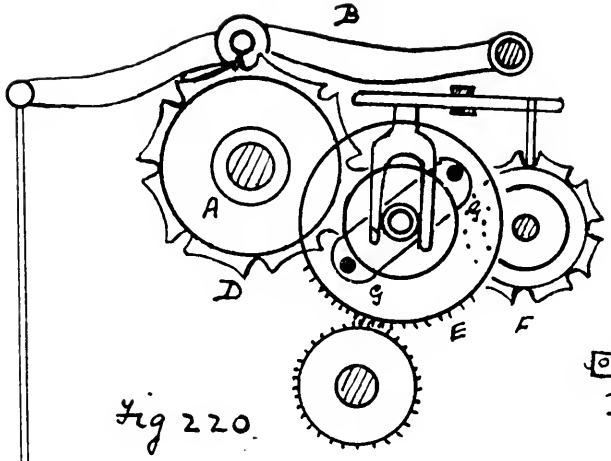



Fig 220.

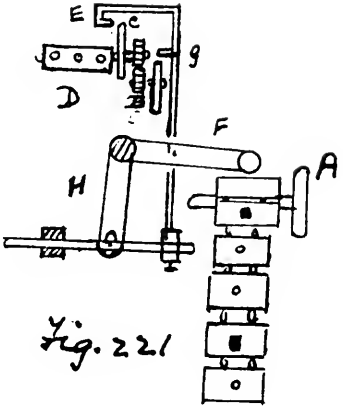



Fig. 221

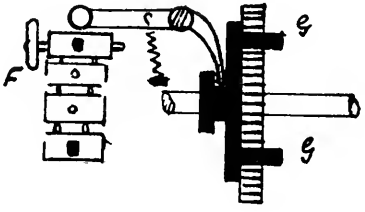



Fig. 220a

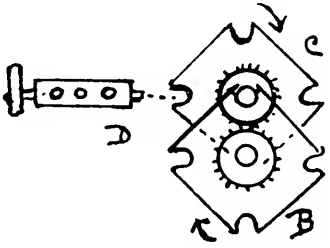
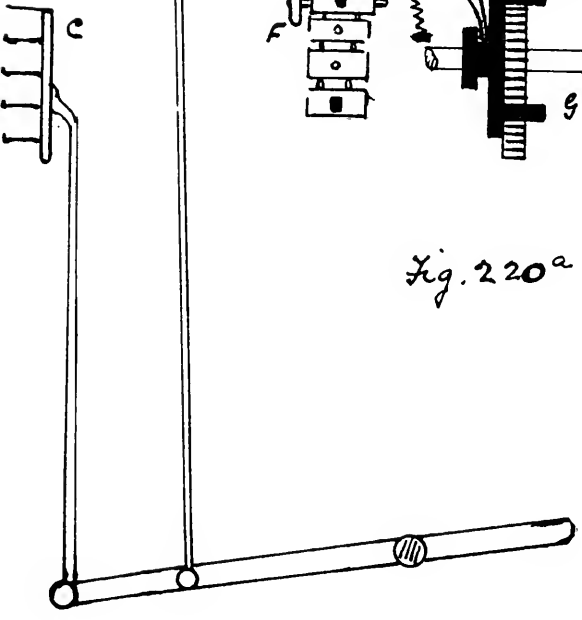



Fig. 221a



SWIVEL WEAVING. Extra weft spot figures are sometimes made in an ordinary Circular or Drop-box loom, but this method causes considerable waste of material, as when the extra weft is not forming figure, it is floating loosely behind the cloth, and must afterwards be cut away by a shearing process. A much better arrangement is to use Swivel Shuttles, these are small shuttles fitted into a movable frame, and the whole arrangement connected to the slay cap of the loom. In using these shuttles very little more weft is taken up than what is actually required to produce the figure. Figs. 229. 230 and 231 illustrates the shuttle (which is about 3" long) and the method of mounting it, when applied to Hand-looms. Fig. 229 a front view; Fig. 230 a side view; and Fig. 231 a plan of the shuttle. When a shed is formed for the extra weft figure, the threads are lifted into the opening A. (Fig. 229) the frame B is lowered, and the shuttle is slided across the opening, beneath the lifted threads.

Fig. 232 illustrates the arrangement when Swivel shuttles are applied to power looms. A. is a movable rack fixed to the slay cap, it gears with the wheel C, which move the shuttles D. across the openings E. the levers F. G. are connected to spare hooks of the Jacquard for the purpose; The tappet H which is movable longitudinally on the bottom shaft, acts on the treadle I and brings down the swivel shuttle frame into the working position, Spring J take it back when the tappet ceases to act; tappet H is placed in and out of position by the levers K. L. worked from the Jacquard; a pick and pick loom is required to enable a pick to take place from an empty box when swivel picks are put in. for that purpose an underpick pick and pick loom is used, the levers M. N worked from the Jacquard regulates the picking. (See also Fig. 214 page 80)

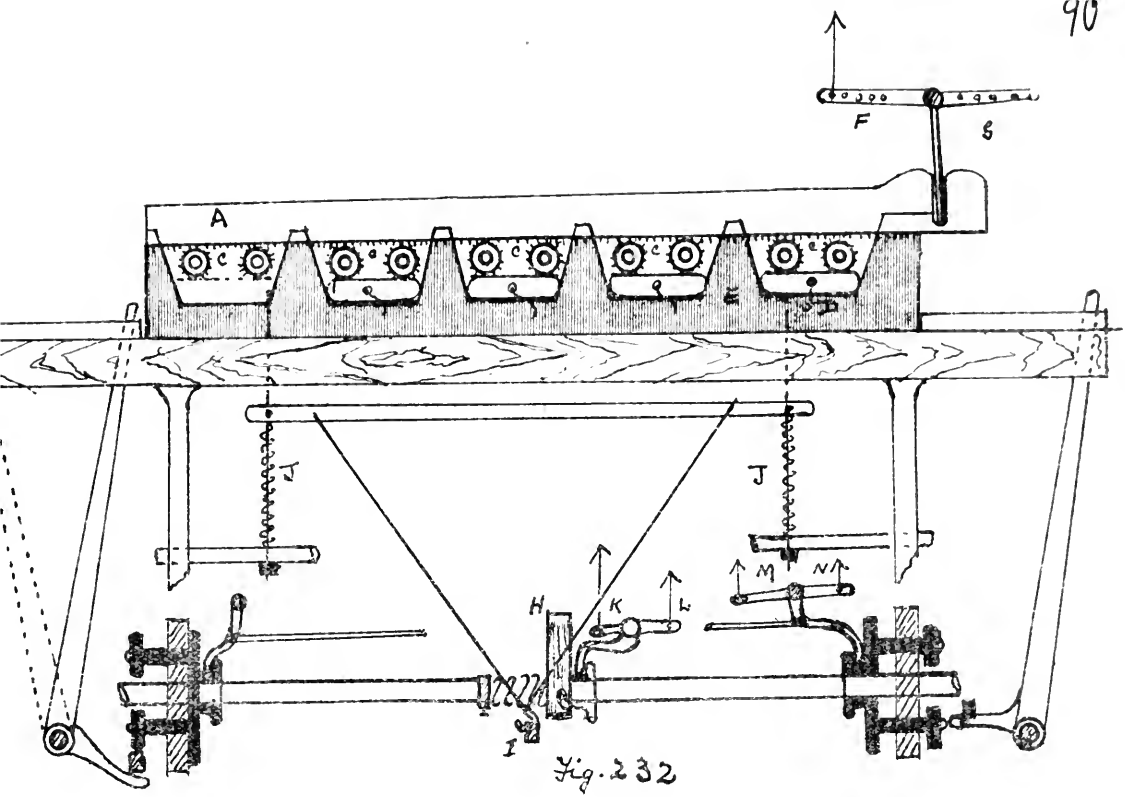



Fig. 232

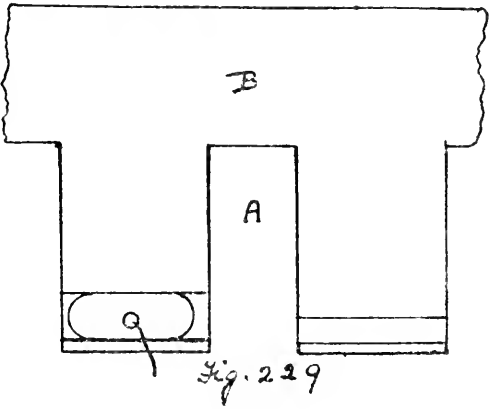



Fig. 229

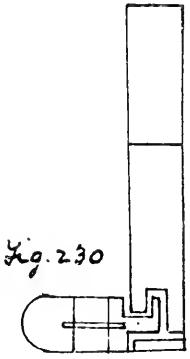


Fig. 230

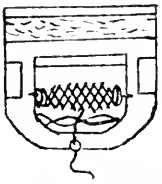


Fig. 231

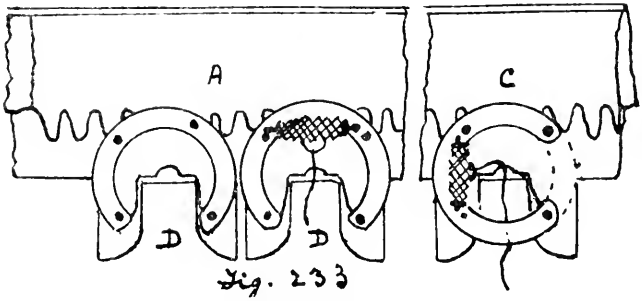



Fig. 233

CIRCULAR SWIVELS. The space that each shuttle occupies determines the distance the figures must be set apart, as there can only be an extra spot opposite to each opening A (Fig 229, By using "Circular Swivel Shuttles" the figures may be set closer together; the shape of the shuttles and their action is shown in Fig. 233; the threads are lifted into the opening D and by means of the toothed rack A the shuttles are turned completely round, the weft bobbin passing underneath the lifted ends. C shows the shuttle in the act of turning.

HOSE-PIPE and BELTING LOOMS. Hose-pipes are usually woven with a loom specially built for the purpose, one cloth to one loom Fig. 234 illustrates one type in which the picking of the shuttle is positive, a rack A gears with wheels B, the wheels gear with the underside of the shuttle, the rack being connected with picking tappets. In many looms the shuttle is thrown by the usual underpick motion When several BELTS are woven in the same loom, one picking arrangement is common to all the cloths, the motion being obtained from treadles A, B, worked by a pair of tappets Fig. 235

SMALLWARE WEAVING, for Tapes, Ribbons, Ties, Lampwick, Boot tabs, Suspenders, Book-markers and narrow cloths coat-hanging. generally. A number of swivel shuttles are mounted in a slay and each shuttle is confined to its own cloth, a seperate beam (warp) is required for each cloth; a common Take-up roller is used for all the cloths, A Fig. 236, but a seperate Roller B is used for each cloth; B is kept in contact with A by means of a strong spiral spring C. When several colours are used, the different shuttles A, B, C. Fig 234 are brought on a line with the cloth, by allowing a bowl D which is fixed to E to run up inclined planes F, G, H as the slay moves back. F, G, H are lifted by the Jacquard as desired.

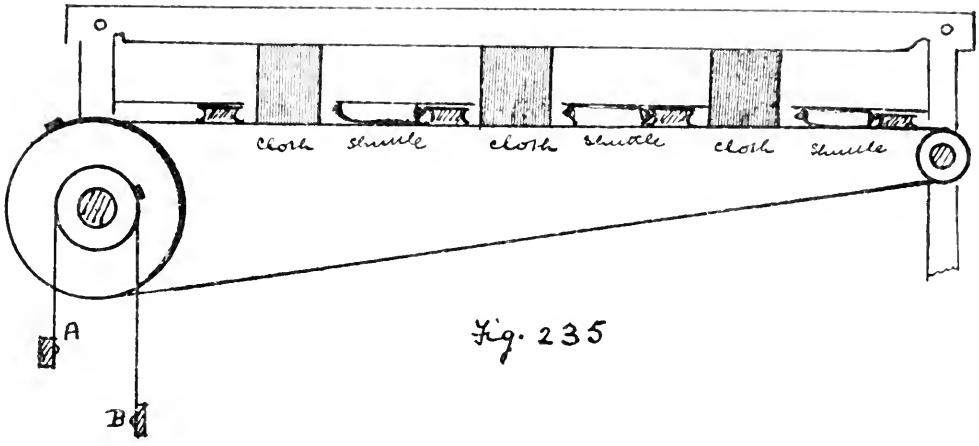



Fig. 235

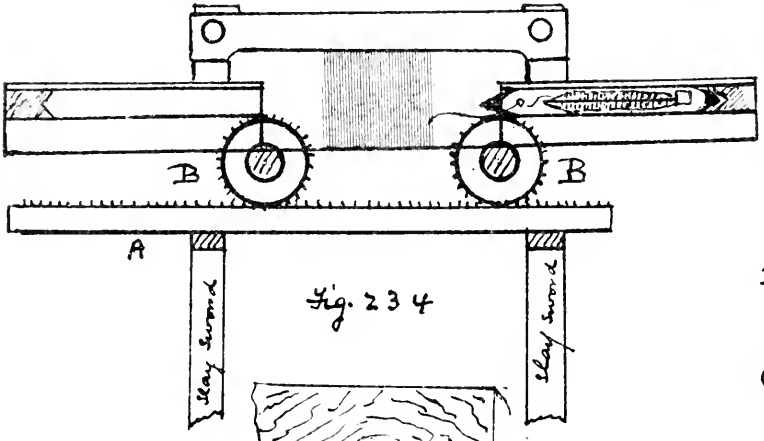
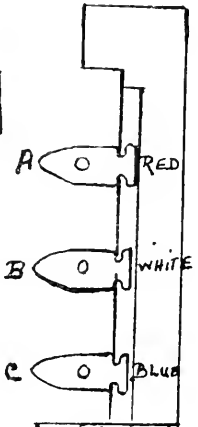



Fig. 234



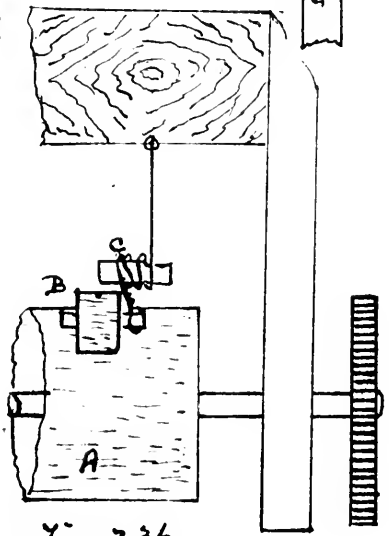




Fig. 236

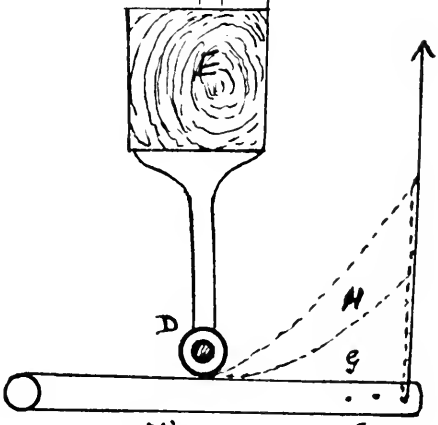
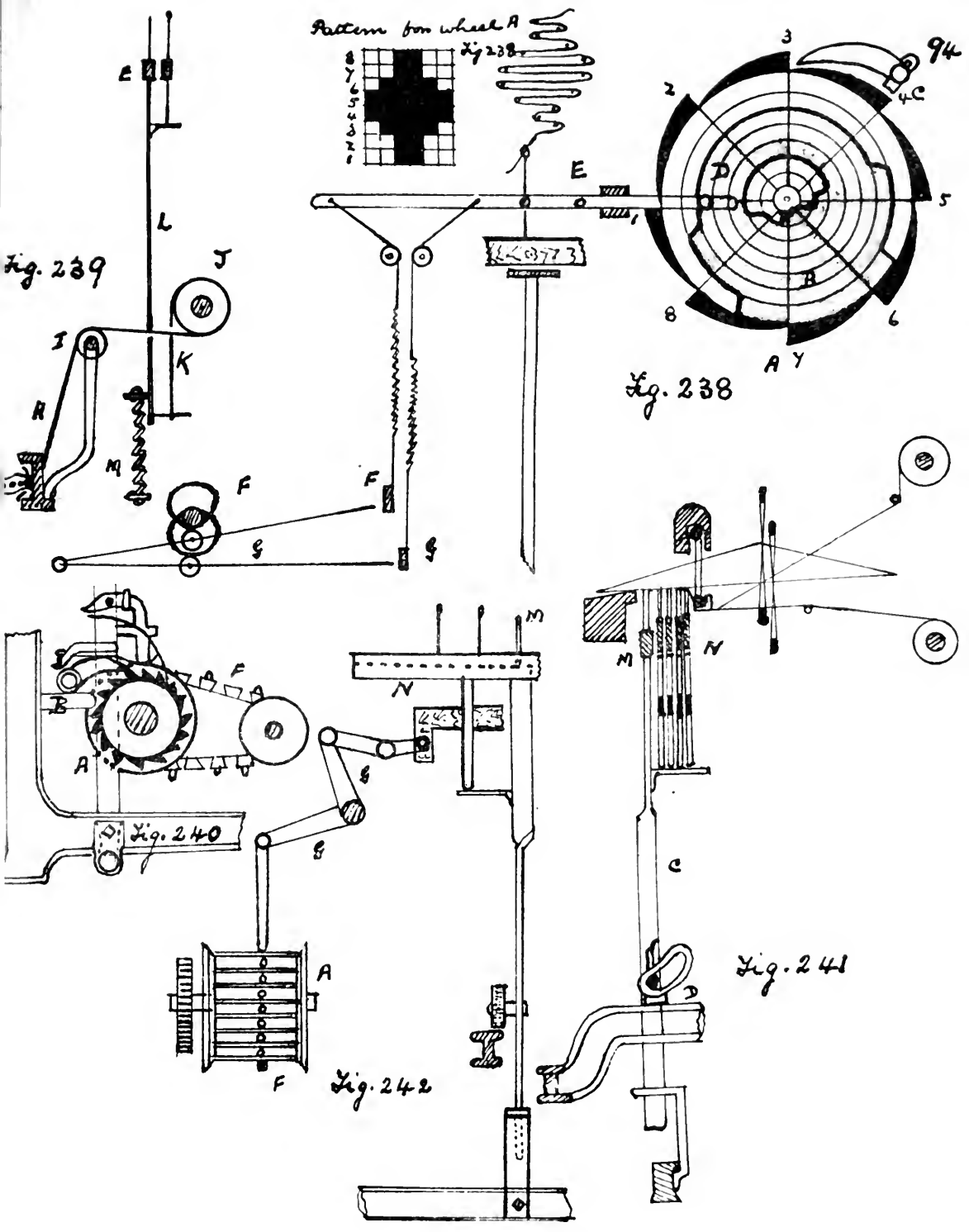



Fig. 237

LAPPET WEAVING. This class of weaving consists in the ornamentation of fabrics by means of extra warp, where the extra warp is used for figuring only. The mechanism consists of a needle frame situated in front of the reed, it can be raised and lowered into the shed, it is provided with pins, having a small eye at the top through which the extra warp end is drawn; this frame is capable of being moved from side to side, the distance it can move in any direction determines the size and shape of the figure. The oldest system is known as the Scotch System illustrated in Figs 238, 239 or 246 A large wood wheel A (Fig. 238) is fixed to the slay at one side of the loom, a groove B is cut out of the face of the wheel; the wheel is driven by a pawl C one tooth every two picks, the pin D fixed to the needle frame E is moved from one side of the groove to the other; E receives a backward and and forward horizontal motion from the tappets and treadles F. G. Fig. 239 shows the method of lifting the needle frame into the shed. H is a strap fixed to the front of the loom, it passes over a guide pulley I is is connected to a roller J fixed to the slay sword, a strap K passes round J in the opposite direction and is connected to the rod L which support the needle frames, when the slay is thrown back the roller J is turned round due to the pull of the strap H, this action winds up the strap K and lifts the needle frame E into the shed, when the slay comes forward to beat up the weft the spring M comes into action and pulls down the needle frame. Fig. 243 shows the construction of a lappet wheel for the Patterns Fig. 244 The wheel is divided into as many circles as there are ends in the pattern plus


Pattern for wheel A
Fig 238.
E
L
J
I
K
H
M
F
F
G
G
Fig. 239
1
2
3
4C
5
6
7
8
D
B
A
Y
Fig. 238
A
F
B
A
Fig. 240
M
N
N
G
G
A
F
Fig. 242
M
N
C
D
Fig. 241

four for the pin, and into as many teeth as there are picks in the pattern on design paper; then make the width of the groove opposite to each tooth equal to the number of ends in the pattern, allowing four extra for the pin.

Fig. 240, 241, and 242 Shows the mechanism for working the needle frame in Galloways motion, where the movement of the frame is determined by 36 different sizes of pegs, increasing in size from 3/8" to 1/2" in steps of 1/32nd part of an inch. In Fig. 240 is shown the barrel A which carries the pegged lattice, it is fixed to the slay sword, a pawl B fixed to the front of the loom, pushes forward the barrel one tooth for each pick. Fig. 241 shows a side elevation of four needle frames N, and the bar M which serves as a false reed, (against which the shuttle rests as it moves across the loom) it is fixed to an upright rod C which carries a pin D working in a grooved bracket E fixed to the cross rail of the loom, when the slay is thrown back the pin D moves up the slot and lifts the false reed and needle frames into the shed. Fig. 242 gives a front elevation of barrel A with the pegged lattice F. a bell crank lever G is fixed to the needle frames, the other end rests on the pegged lattice F. as the various size of pegs come under the end of the lever, the needle frame N is moved to and fro. Fig. 245 shows the pegging plan for the pattern Fig. 244 the numbers on the side indicates the picks and the numbers along the top, the different sizes of pegs to use on the respective picks to which they are opposite.

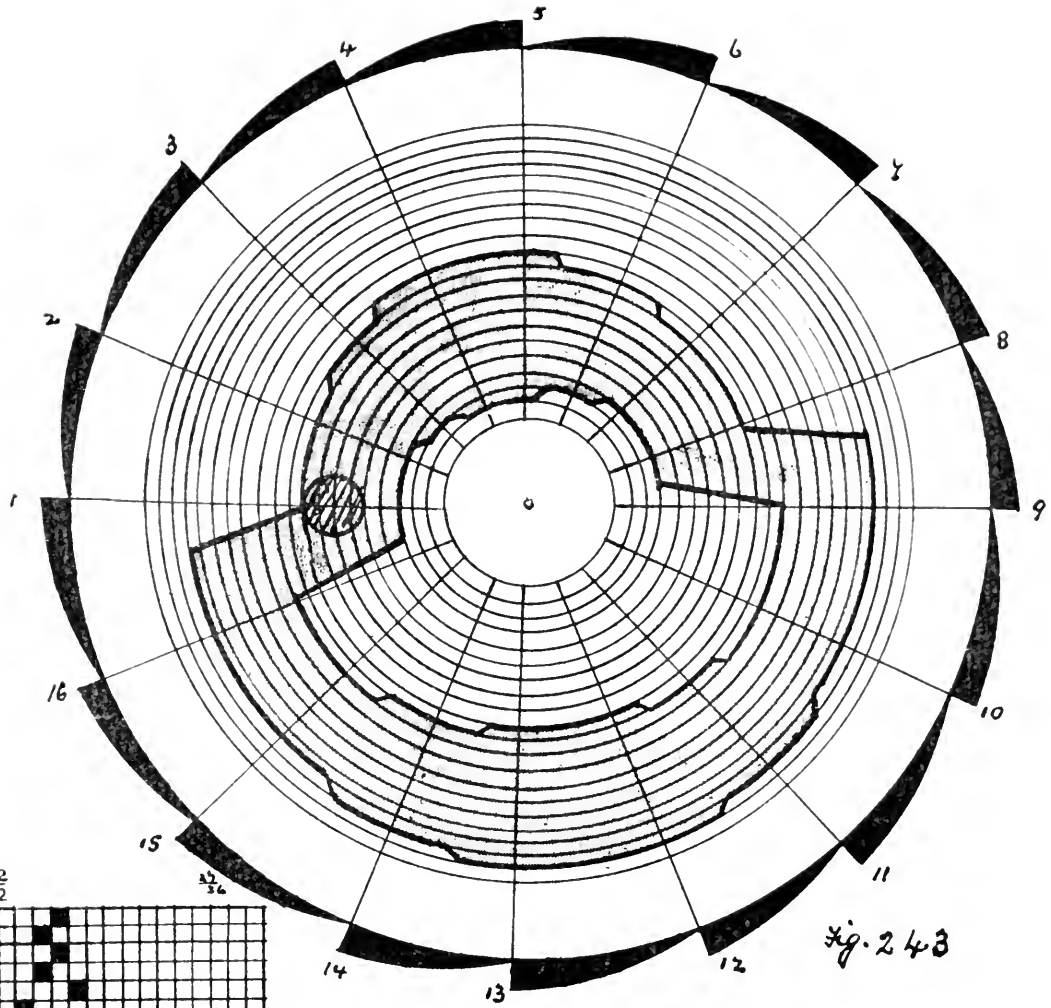



Fig. 243

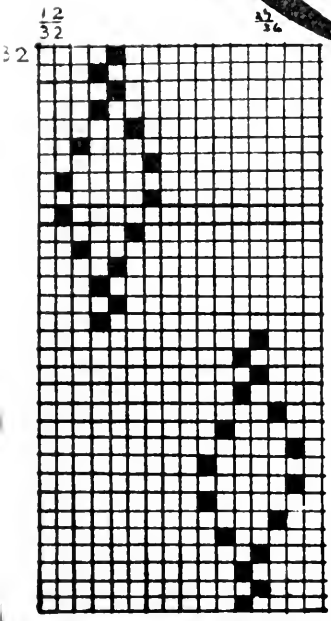



Fig 245

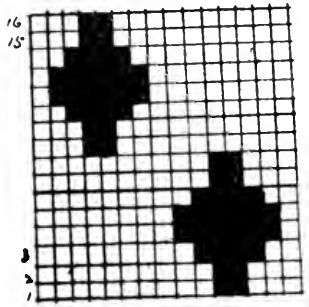
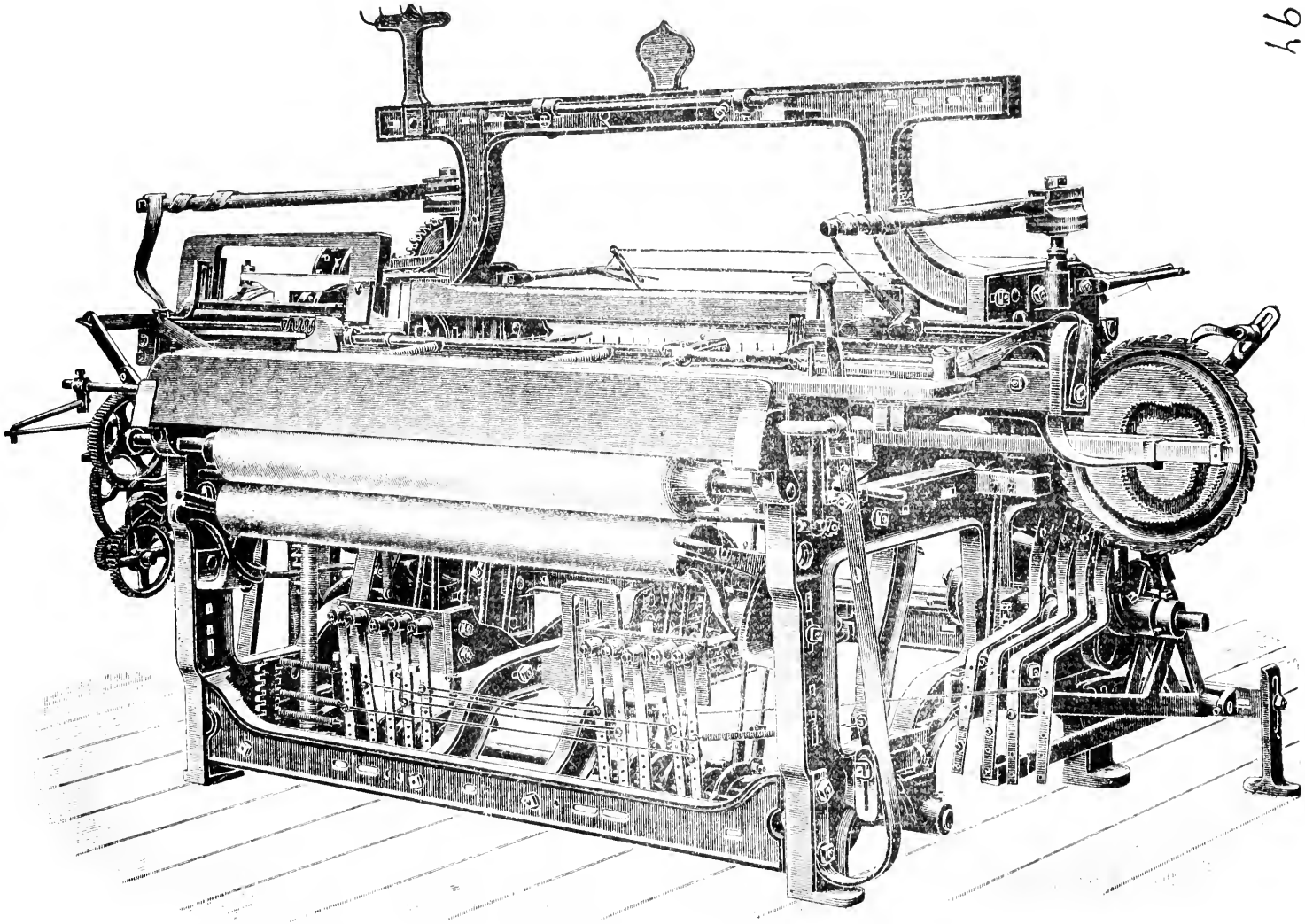



Fig. 244



THE CARPET LOOM.

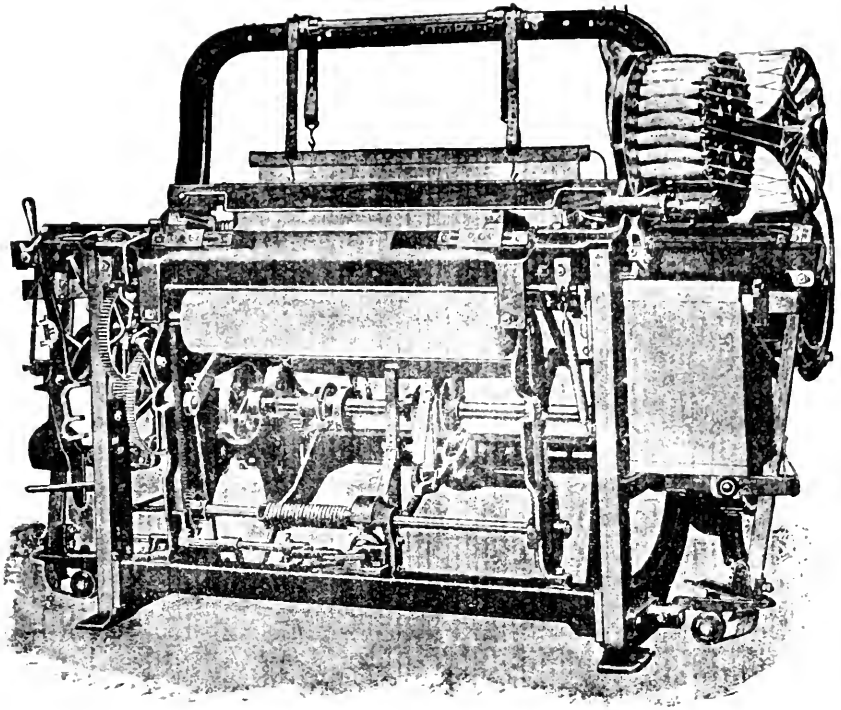


Fig. 247

THE NORTHROP LOOM. Fig. 247. amongst the many automatic looms, the northrop loom is well known, and the automatic weft supply mechanism of this loom will be taken for illustration

Fixed to the front of the loom (not to the slay) is a large circular hopper capable of holding 25 cops; the hopper is shown fixed to the loom in Fig. 247. The cops are placed on shuttle pegs Fig. 248: the pegs have a round end of wood, covered with two or three coils of wire, this enables the weaver to firmly grip the peg when skewering the cop, the cops are then placed in the hopper and held by spring clips. The only motion of the hopper (a fuller and more detailed view of which is shown in Fig. 249) is circular, and each time the weft is beaten up to the fell of the cloth, the shuttle box is brought directly underneath the lowest cop in the hopper. The shuttle peg is held in the shuttle

at the wire covered end, by means of spring clips, the peg is removable bodily, and by pushing firmly against it, it can be pushed out at the bottom of the shuttle. The shuttle is self threading, to accomplish this, there is a groove along the top of the shuttle. Figs. 250. 251 and 252, on the first pick the weft falls into the groove, this groove is turned towards the shuttle, and the weft following the direction of the groove, on the second pick, the shuttle is completely threaded The weft fork Fig. 253 brings about the automatic change of the cop. See Figs 253 and 254, connected to the weft fork holder A, is a lever B, this leaver is fixed to a rod C which extends across the front of the loom, at the end of the rod C are connections with the short lever D Fig. 254. D is connected and forms part of the bell crank lever E G with its fulcrum at F, the other end of G rests above the bottom cop H in the hopper J; the above mentioned parts are fixed to the breast-beam of the loom. I is the shuttle in the box; K the crank arm; L a short stud fixed to the box front. Its action is as follows - when the weft fork acts and indicates the weft broken or finished the weft fork M Fig. 253 remains down, and is pulled forward by the hammer lever N, this pulling forward of the weft fork operates the lever B and turns the rod C part way round, this action lifts the short lever D Fig. 254; when the slay comes forward the stud L on the box front strikes D, and operating the lever E G, the end of G forces the cop out of the hopper into the shuttle, to take the place of the spent cop, the latter falling through the bottom of the box into a can standing at the side of the loom.

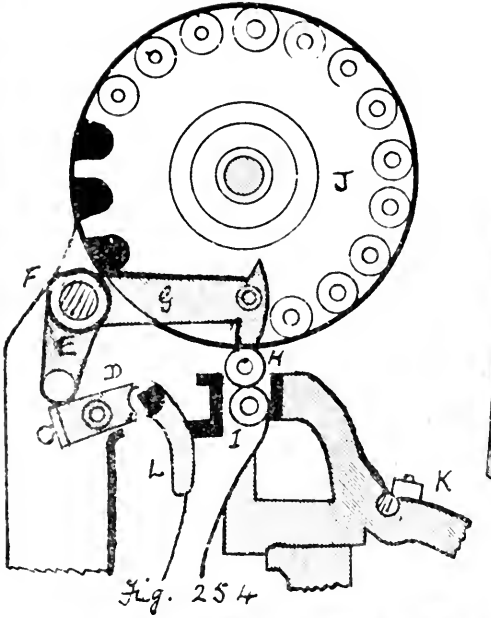



Fig. 254

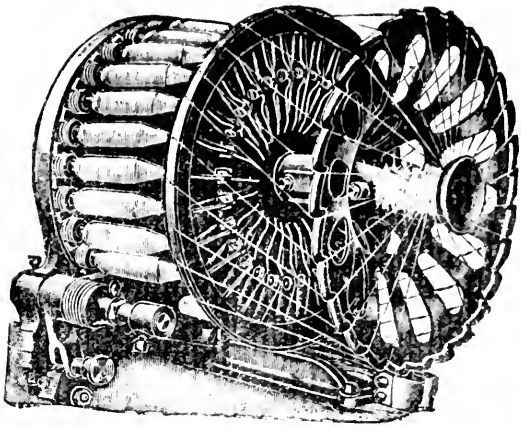


Fig. 249

Fig 248

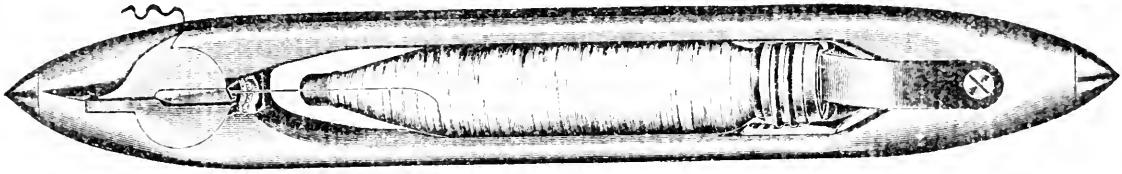


Fig 250

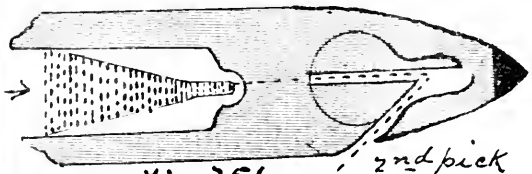


Fig. 251 2nd pick

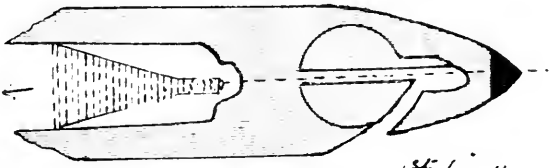


Fig. 252. 1st pick

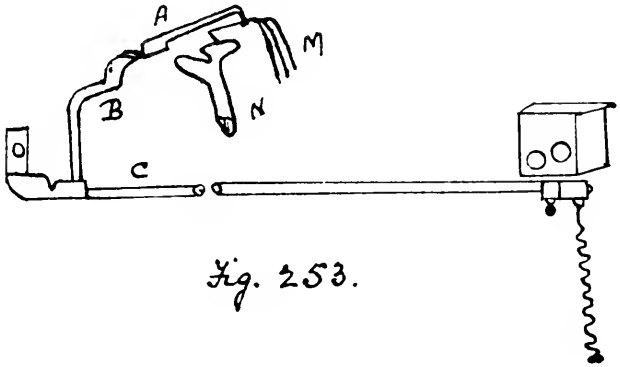



Fig. 253.

# THE JACQUARD MACHINE.

This machine was inventented about 1801 by a Frenchman named Jacquard. Upon its introduction it was fiercely opposed by the silk weavers of France, whom it threatened to deprive of their employment, but its advantages over the methods then in use were to great to suffer resistance, and many years before his death (which occured in 1834) the inventor had the satisfaction of seeing his machines in almost universal use. In 1840 a statue was erected in Lyons upon the spot where it is said his looms were publicly burned. An interesting sketch of the life of Jacquard appears in the "Encyclopedia Britannica". By the aid of a Jacquard machine the pattern producing power of a loom is enormously increased; a machine of 200 needles or hooks will produce a pattern of 200 ends in one repeat, and the length of the pattern will depend upon the number of cards used. The principle of construction of the machine is that by means of paper cards, perforated and left blank, any order of lifting of the hooks and consequently warp ends may be obtained. The cards are cut to suit a pattern, then laced together, and brought in succesion to the needles of the machine. Fig. 255 gives a general view of a 200 Single life jacquard, showing Hooks A; Needles B; bottom board C; neck-cords D; Harness E; Comber-board F; mail eyes G; and a repeating pattern H. The machine is placed on the loom, with the cylinder behind and the cards to fall over the warp. The needles, neck cords and the holes in the Comber-board and mail eyes are numbered for the 1st and

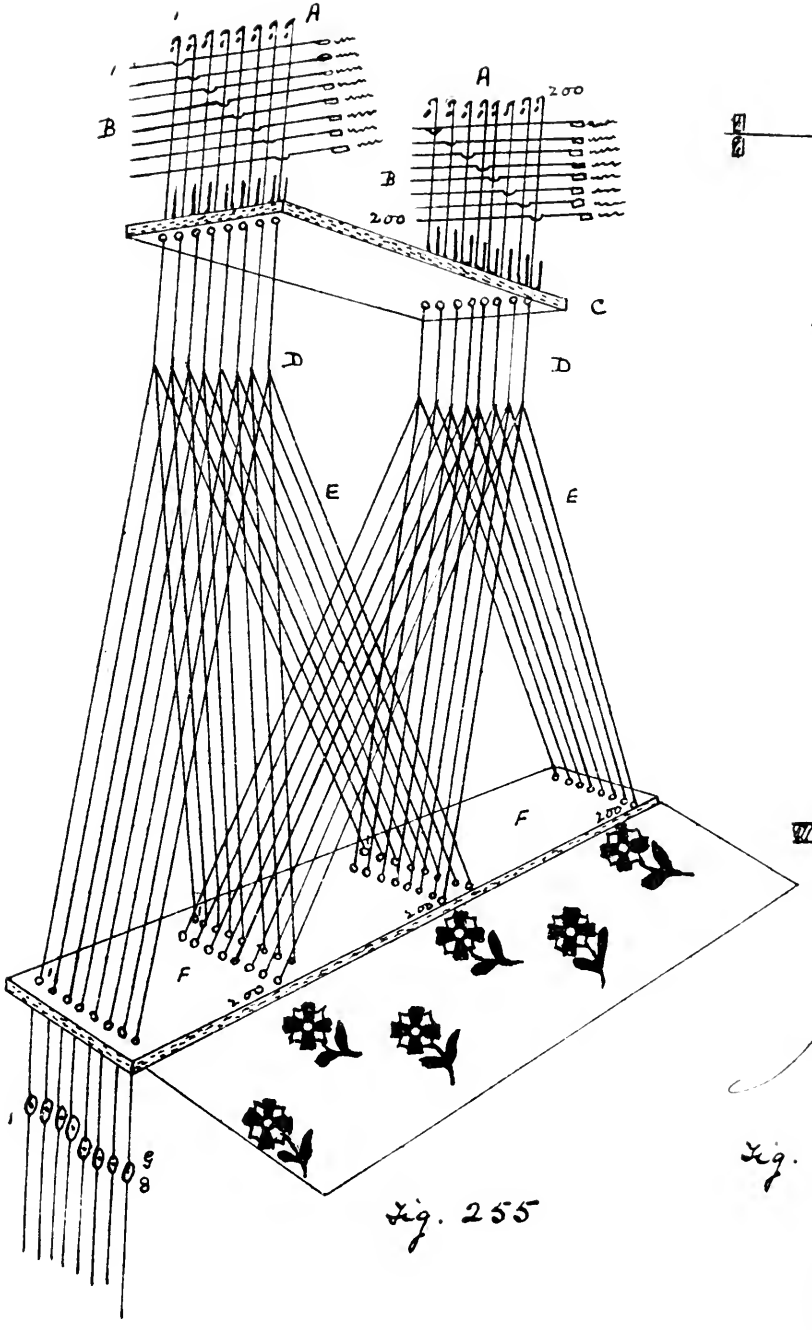



Fig. 255

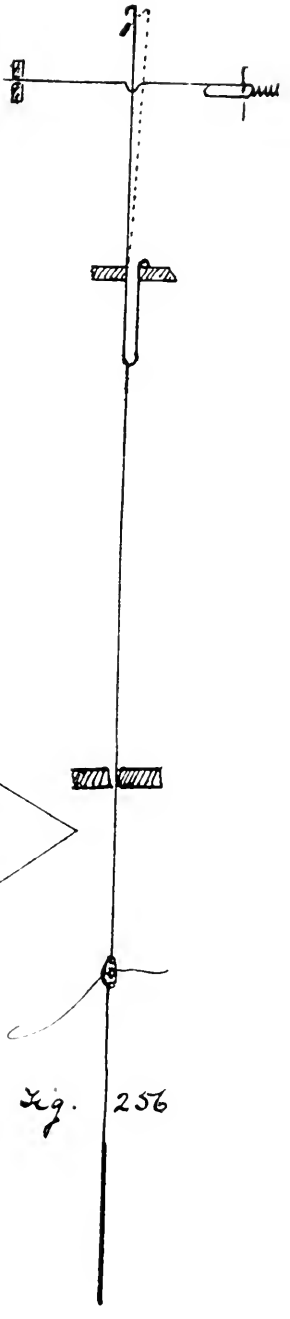


Fig. 256

and the 200th end of the pattern. Fig. 256 shows the detailed working of one hook, a hole in the card allows the hook to be lifted, a blank pushed the hook back as shown by the dotted lines and allows a thread to remain down. Fig. 254 shows the arrangement of needles and hooks in a Double lift single Cylinder machine; there are 8 needles A, and 16 hooks B in each row, one needle controls two hooks, each pair of hooks are connected at their lower ends to the neck cord C, to which the harness is attached, the two hooks by this means lift the same warp end. There are two rising griffes D and E (for taking up the hooks.) they are worked by draw rods and cranks, fixed to the end of the bottom shaft of the loom; when the griffe D is at full shed, the other is at the lowest point. Fig. 258 shows the working of the cylinder: by means of an eccentric A fixed on the crank shaft of the loom, and a rod B connected to the levers shown, the cylinder C which carries the cards receives a swinging motion; every pick the cylinder moves outward and one corner of it is caught by the catch D, and the cylinder receives a quarter of a turn, and brings another card into action. Fig. 259 gives a card reversing motion, by pulling the string A connected to the lever B.C. the rod D moves forward, and catching the corner of the cylinder, gives it a turn, the projection E coming underneath F lifts the catch out of the way, leaving the cylinder free to be reversed for finding a broken pick.

The advantages of a "Double lift machine" are — A counterpoise arrangement is obtained whereby a falling griffe helps a rising griffe: the griffe move only at half the rate, and the machine can be run at a quicker speed

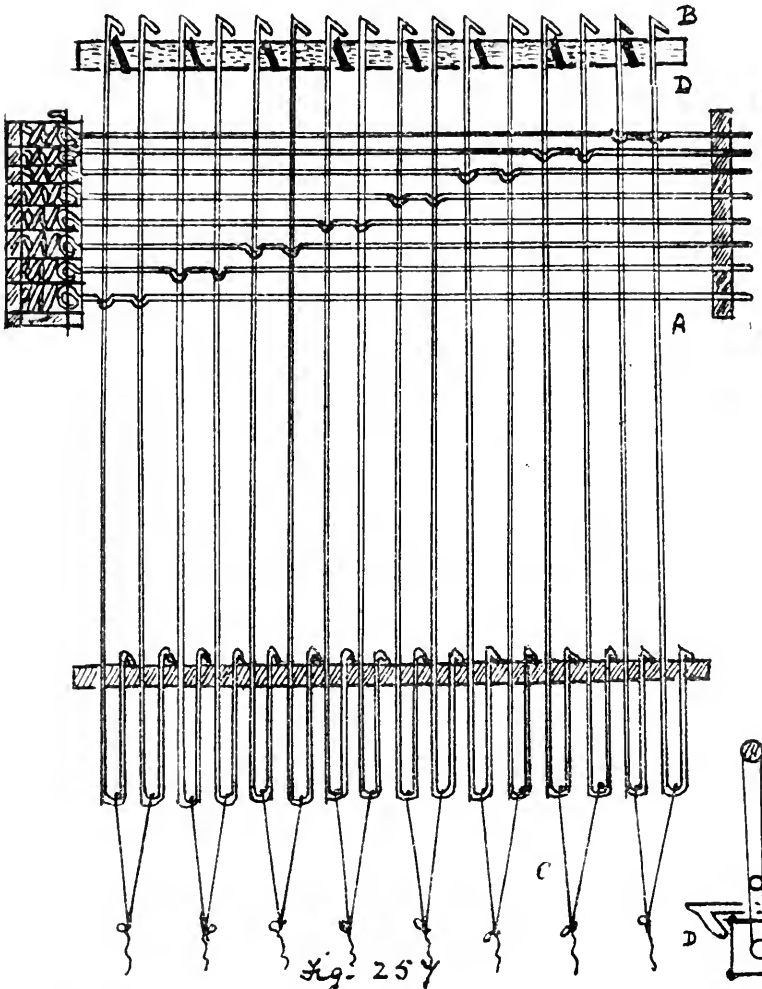
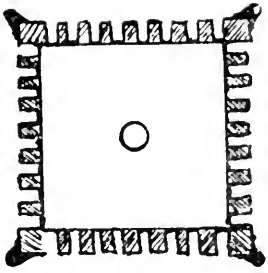
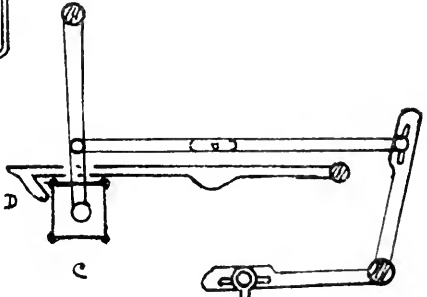



Fig. 254



card grinder



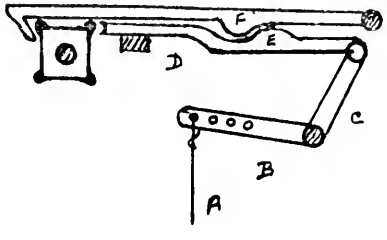




Fig. 259

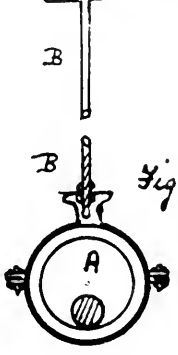



Fig 258

TWO CYLINDER DOUBLE LIFT JACQUARD. Fig. 260. A 400 machine of this type is most commonly used in the cotton trade, for "Brocades" and similar cloths. By employing two cylinders the speed of the cylinders is reduced one half, this enables the loom to be run at a higher speed than in the case of a single cylinder. The two cylinders A and B are placed, one on each side of the machine, the needles from the respective cylinders work the hooks with their sneck ends C facing them. the top needle of the cylinder A controls the same thread as the bottom needle on the cylinder B the two hooks F and G being connected at their lower ends by the neck cord H. The cards are laced together in two sets, all the odd numbered cards for one cylinder, and the even numbers for the other cylinder.

Fig. 261 shows the working of the two cylinders A. B; an eccentric C is fixed on the tappet shaft and through the rod D, and levers E. F. G H works the cylinder B; the lever H is connected to the cylinder A the outward swing of B brings to the needles & vice-versa.

One of the difficulties to contend with in using a two cylinder jacquard, is, that one cylinder is liable to get out of time with the other, and spoil the pattern. Fig. 262 illustrates Riley & Riley's arrangement for stopping the loom whenever this occurs. Two hooks A and B at the side of the machine are set apart for the purpose, and worked from opposite griffes C and D; A is connected to a lever E. F. near to the starting handle G; A is kept off the griffe by the spring H on needle I. The cards are cut for the two cylinders, so that when the cylinders are in proper time A is never lifted, but if they are not in unison, a hole on B is followed by a hole on A. the hook A is pushed on to the griffe D through the connection K M, and the loom stops

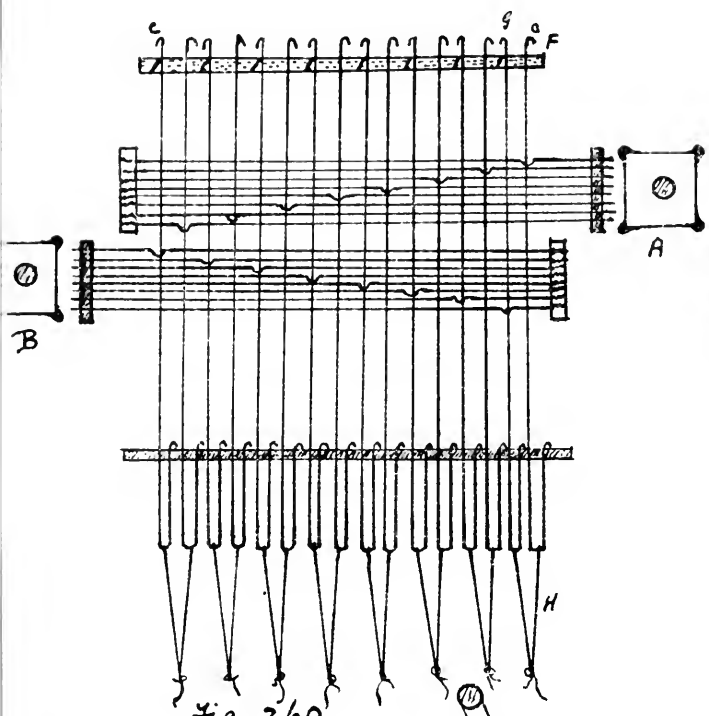



Fig. 260

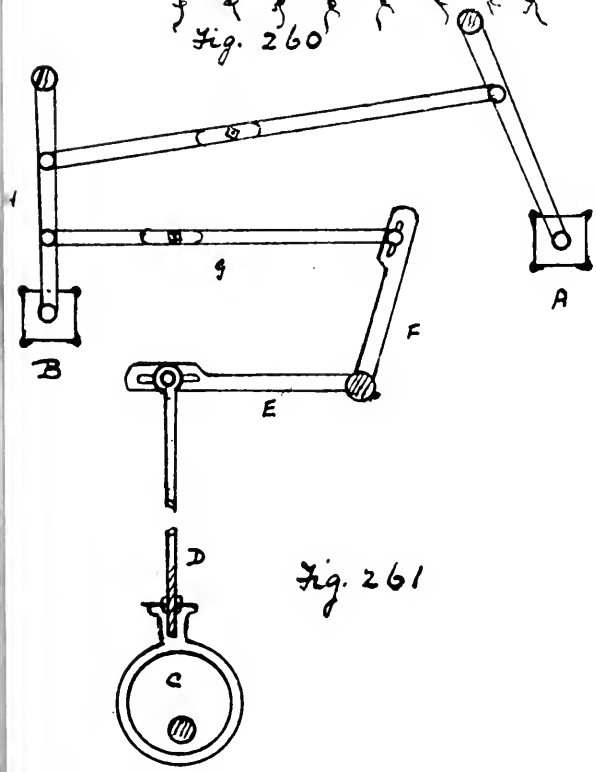



Fig. 261

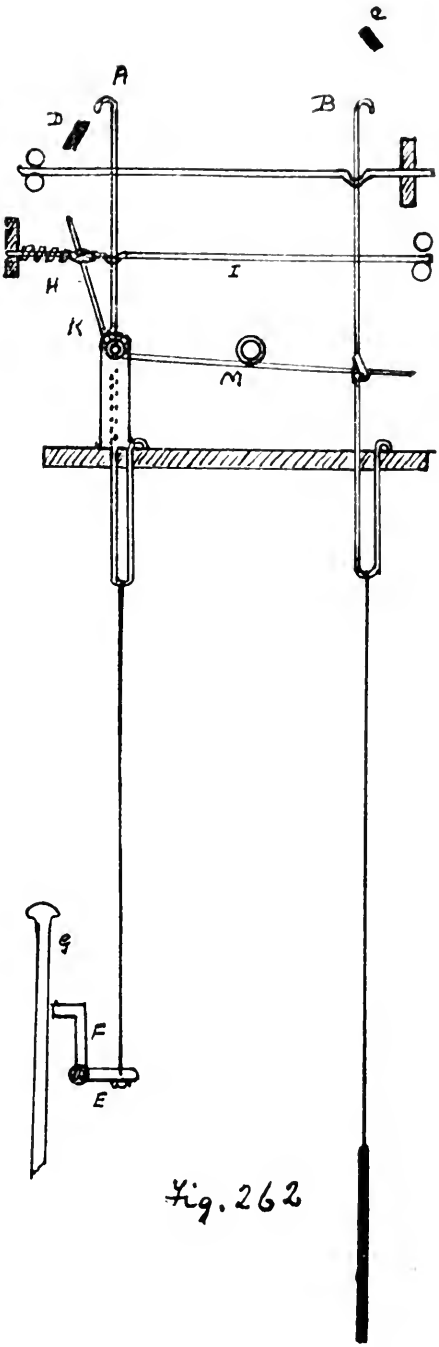



Fig. 262

CARD CUTTING. A card cutting machine is used for perforating the cards in the order of the filled in squares on the Design paper, in a 400 Jacquard a card with 50 rows of holes 8 holes in a row is required, to correspond to the 50 rows of needles in the machine. Fig 263 and 264 illustrate the principal parts of a card cutting machine. Fig. 264 shows a plan of the punch box, the numbered spring punches 1 to 8 are used to cover 8 cutting punches, for one row of holes in the card. (Fig 263 at 4 is shown how the top of the punch is covered) C is a bigger punch for cutting the peg holes at the beginning and the end of a card. A. B. D and E are used, when a card of 12 holes wide is being cut. In Fig. 263 which gives a side elevation of the machine. H is the carriage for holding the card, and drawing it beneath the punches for perforation; I. J is the card clip; K are 50 small pins fixed to the carriage, they are the same distance apart as the rows of needles in the Jacquard machine, L a regulating slide, which allows the carriage to move a distance of one pin at each movement, M the punch box, it is connected to the lever N and is free to rise and fall with the upward and downward movement of N; P are two perforated plates, between which the blank card is pushed, in the upper of the two plates are the punches Q; X, weight attached to the carriage; R and S the foot-treadles for working the machine. R through the connecting rod T pulls down levers V, N and slide L, this allows the carriage to move back a distance equal to one pin, it also lifts the punch block M; the punches 1 to 8 as required are pushed in to suit the pattern; S is pressed down, and through the connecting levers shown, brings down the punch box, and punches the card. Fig. 265 shows the method of fixed the design for card cutting. Fig 266 a card cut for the 1st and 200 end

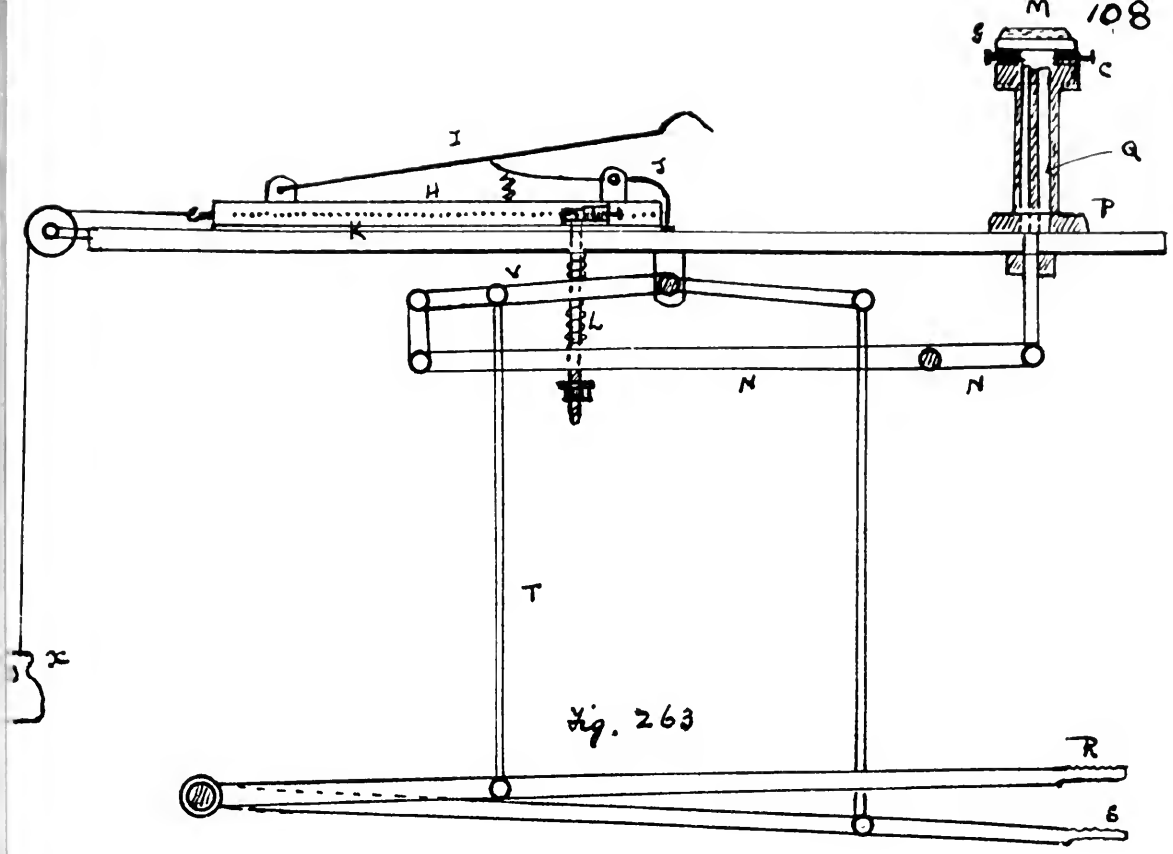



Fig. 263

Fig. 265

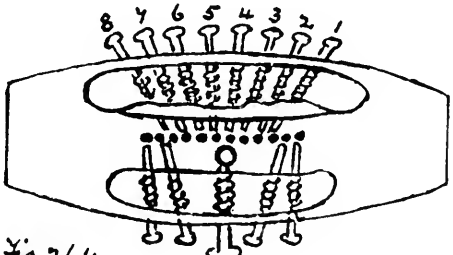



Fig. 264.

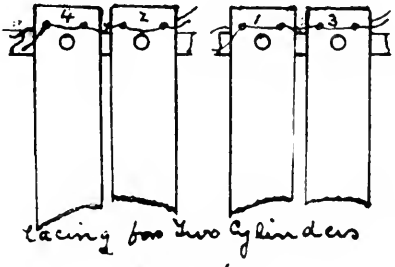



Fig 267

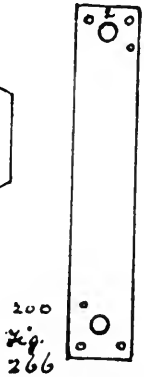
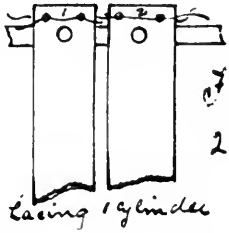



Fig. 266



REPEATING MACHINES. When a set of cards have been cut from the design at the card-cutting machine and laced together, they are ready for the loom. If a duplicate set is required, which is the case, when many looms are weaving the same pattern at the same time, it is usual to duplicate the set of cards on a Repeating machine. These machines of which there are two well known types namely. Devoge's and Mc Murdo, consist of a Single lift jacquard, the hooks of which are made to operate a series of punches instead of warp threads In the Devoge machine Fig. 269 a 400 Jacquard A is suitably mounted on a framing, to the hooks B. the harness C is attached provided with heavy lingoes D; the harness is also attached to cords E which pass over guide pullies F, at the other end of the cord are the punches G; 400 punches are arranged in rows of 8 punches in a row, 50 rows in all, over a perforated plate H, The set of cards to be repeated are passed over the cylinder J, holes in the card select the hooks, and through the harness C and cords E the punches G are lowered when the hooks are lifted; blank cards are brought in succession beneath the punches, the lowered punches are locked in position; the plate H rises and the punches pass through the card.

The Mc Murdo machine Fig. 240 consists of a 400 Jacquard A, at the lower end of each hook B is attached a piece of wire, to which a punch is fixed, so that there are 400 punches, these pass through the plate C, each in rotation, and

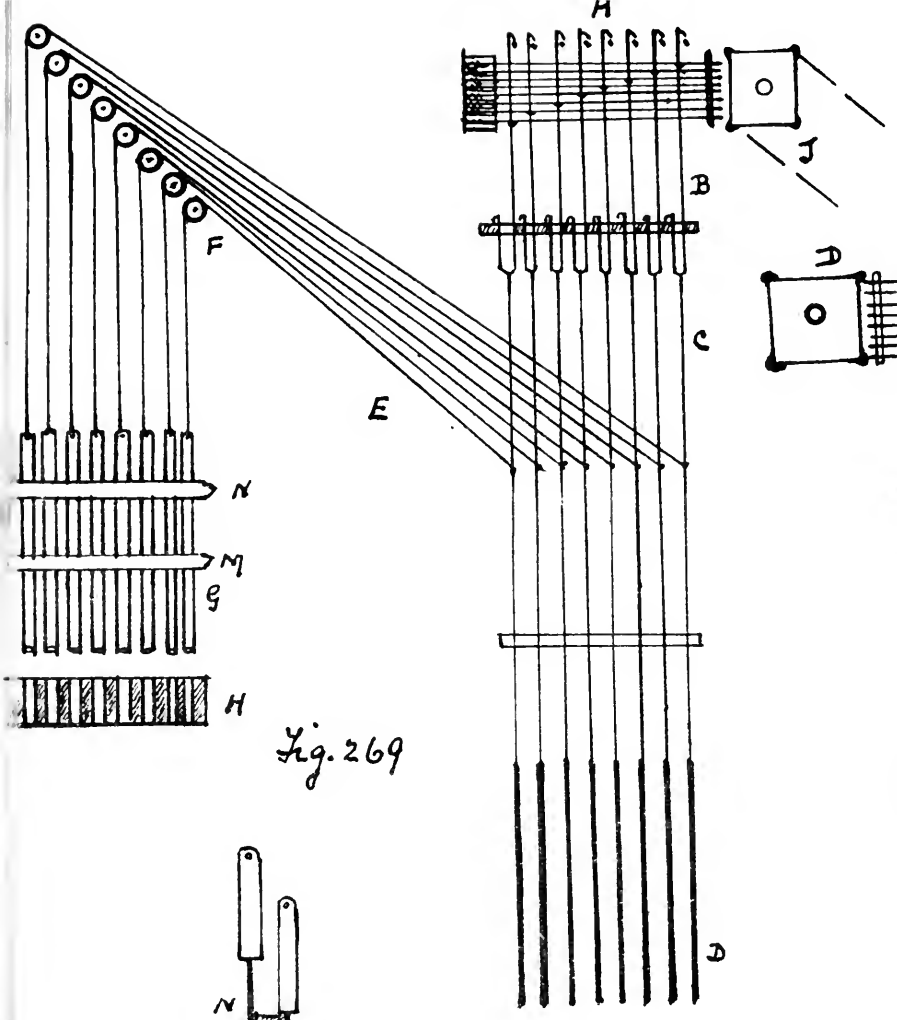



Fig. 269

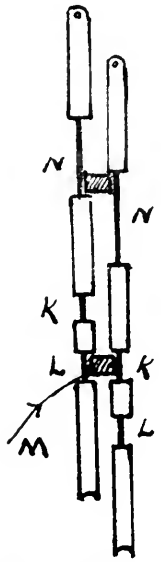



Fig. 241

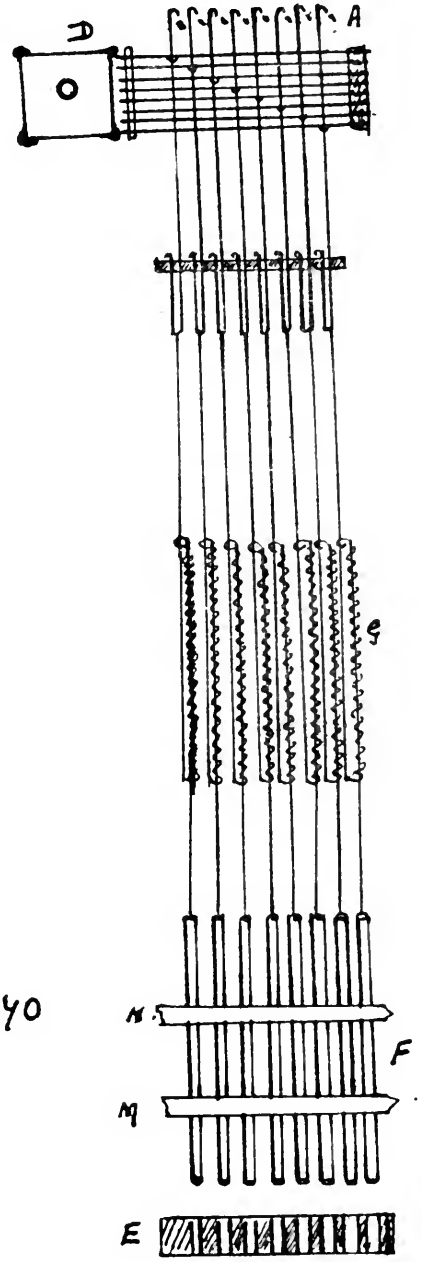
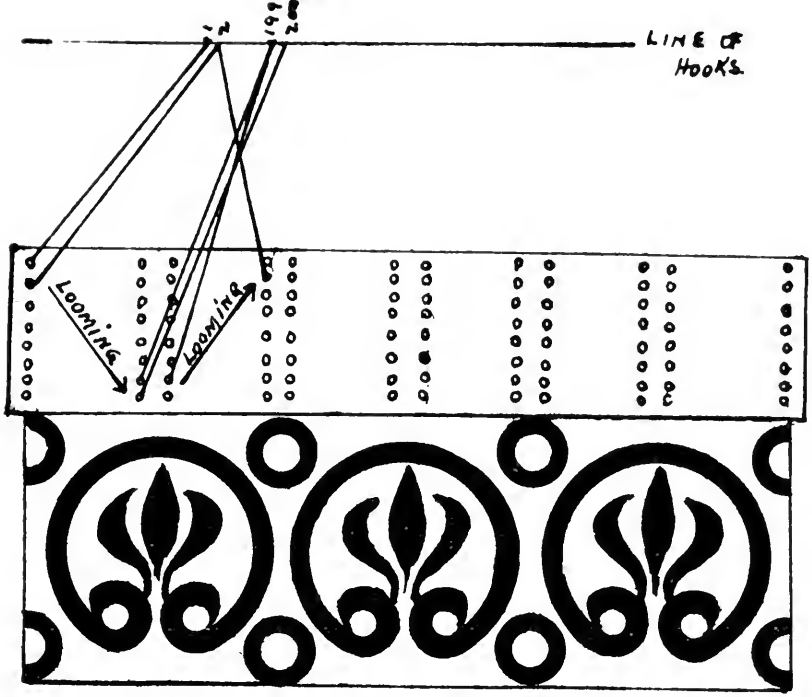



Fig. 240

in rows of 8's to correspond with the rows of needles in the needle board. when a set of cards is passed over the cylinder D of the Jacquard A, and each card in succession brought to the needles, the punches rise and fall in the same way as the harness in an ordinary Jacquard; with this difference, the knee end of the hook being turned away from the cylinder, a blank pushes a hook on to the griffe and indicates a rising hook; In this machine the punch plate E is stationary, but the punch box F rises and falls for each card the sliding wires G, with a spiral spring between them rendering this possible.

The locking of the punches is shown in detail in Fig. 241; the punches are provided with two slots K and L into which a sliding comb M slides, on each punching of a card, thus locking the punches; the comb will slide into the top slot K of the punch left down, and into the lower slot L of the punch which is lifted, in the longer slot N is a fixed comb, which steadies the punches and prevents them turning round.

THE TIE-UP OF JACQUARD HARNESS. The "straight tie" is illustrated in Fig. 255 page 102. The "Centre tie" is shown in Fig. 242, a machine of 200 hooks makes a pattern of 398 ends. The "Border tie" Fig. 243 shows the method of tie-ing up the harness for weaving bordered cloths, as Towels, Handkerchiefs and similar cloths.


LINE OF HOOKS
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LOOMING

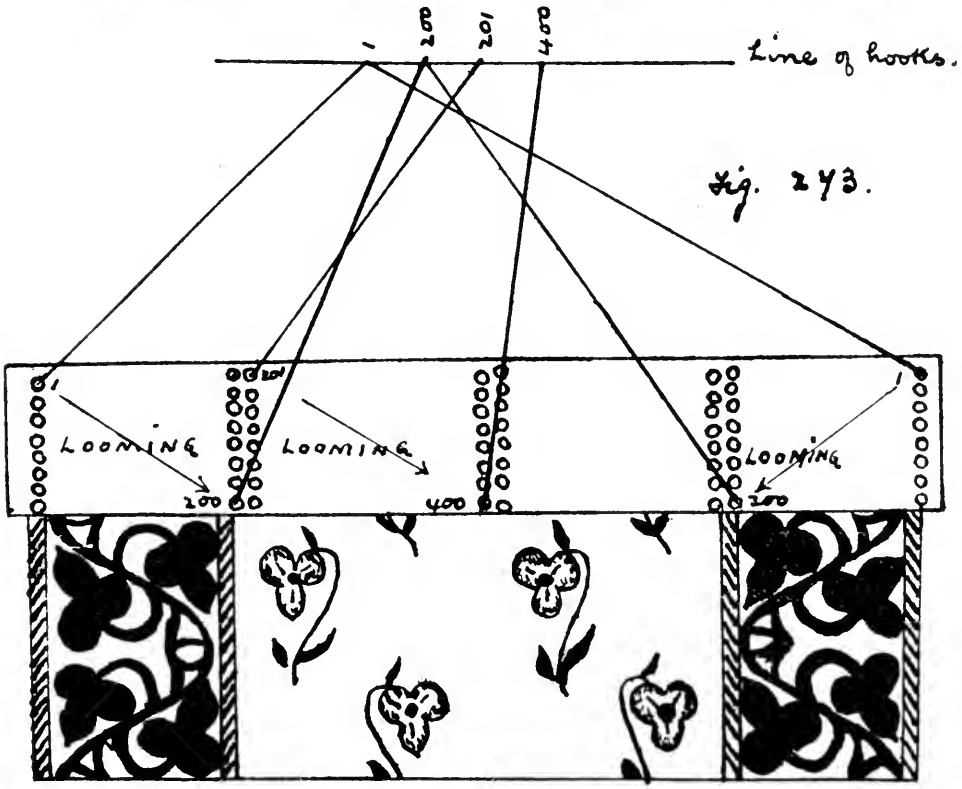

Line of hooks.
LOOMING
LOOMING
LOOMING
200
400
200

Fig. 243.

# DESIGNING and PATTERN MAKING for JACQUARDS.

The simplest forms of patterns are those of a geometrical character, and elementary geometrical designs are often very effective. Figs 274 to 280 give a number of useful skeleton arrangements for geometrical patterns. the whole of these with the exception of Fig. 278 can be constructed by the aid of compasses. Fig. 278 the diamond is constructed with a set square of 60°; at least twenty of such geometric forms ought to be acquired and retained for future use.

These skeleton forms are afterwards clothed, with certain parts emphasized, or left out, and additions made to them for the purpose of making patterns Figs 282 to 284 are constructed on a basis of this kind.

Fig. 281 is based on Fig. 274
Fig. 282 is based on Fig. 279
Fig. 283 is based on Fig. 275
Fig. 284 is based on Fig 278

These few examples are given to show the method of working, and the appearance of the pattern cloth size. For card cutting one repeat of the pattern is enlarged and painted on design paper. Another simple method of preparing a pattern is to take a small sprig or leaf and arrange in alternate order as shown in Fig. 285. Fig. 286 shows the method of working up one of the leaves on design paper.

James Holmes

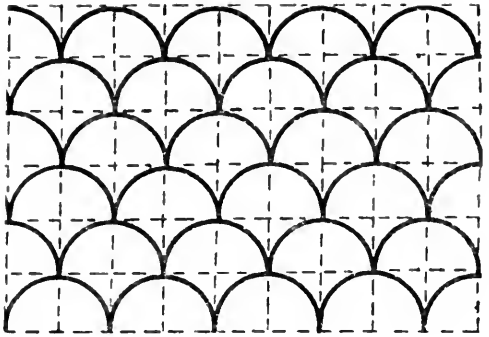


Fig 274

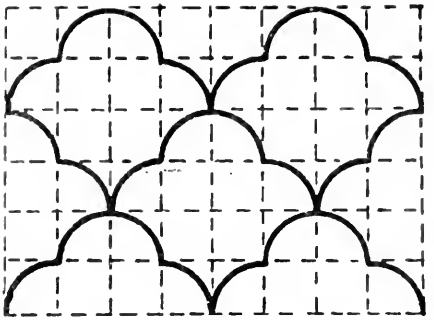


Fig 275

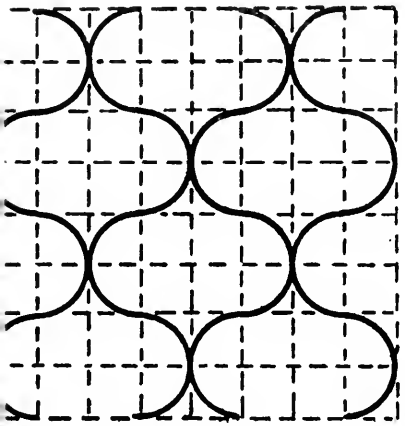


Fig. 276

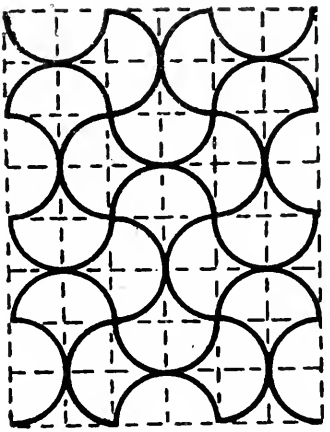


Fig. 277

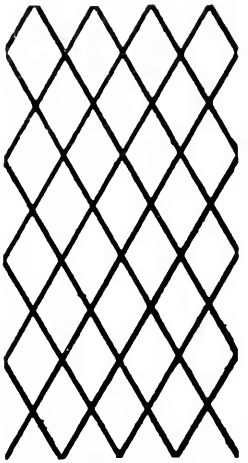
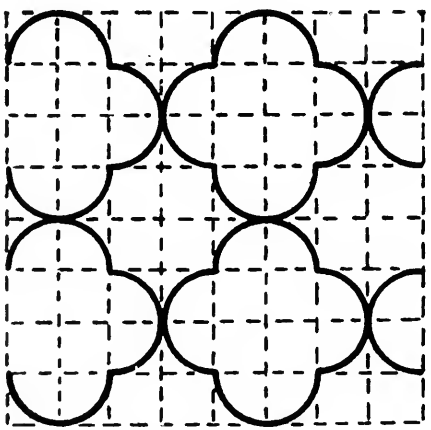


Fig. 278



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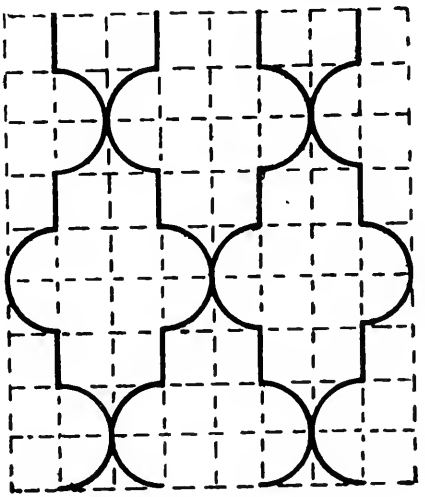


Fig 280

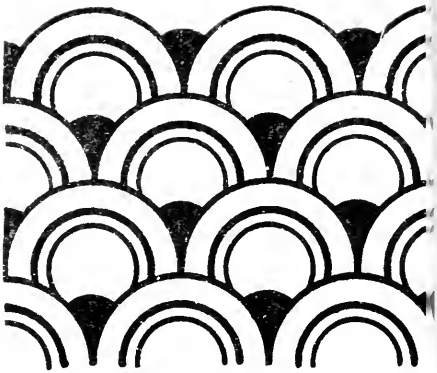


Fig. 281

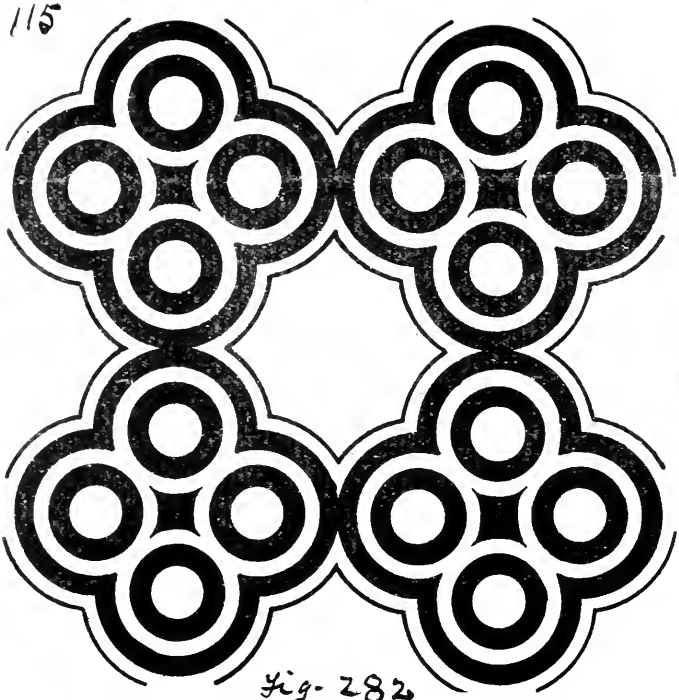


Fig. 282

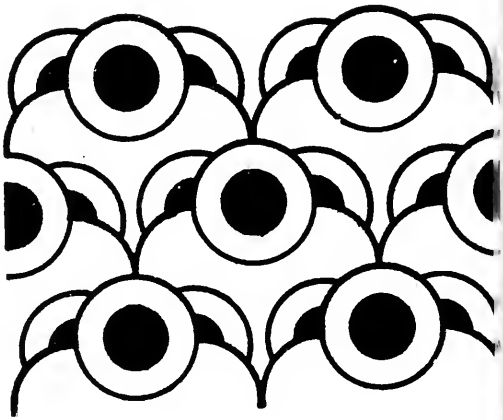


Fig. 283

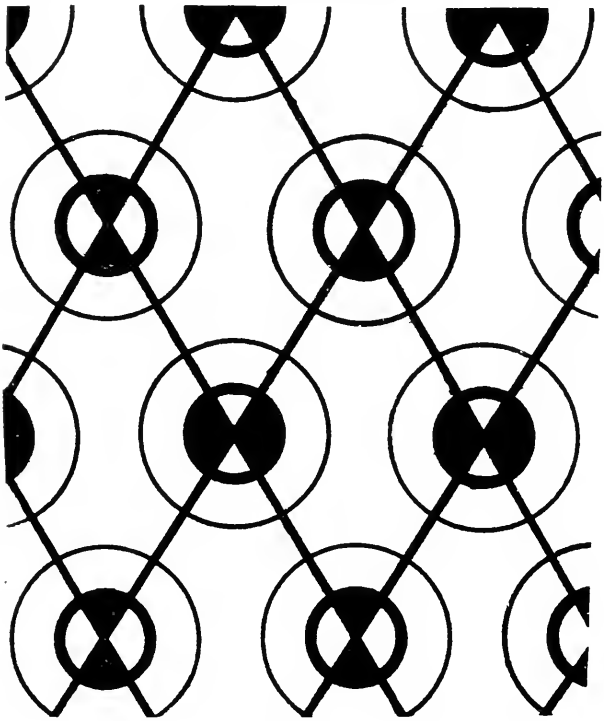
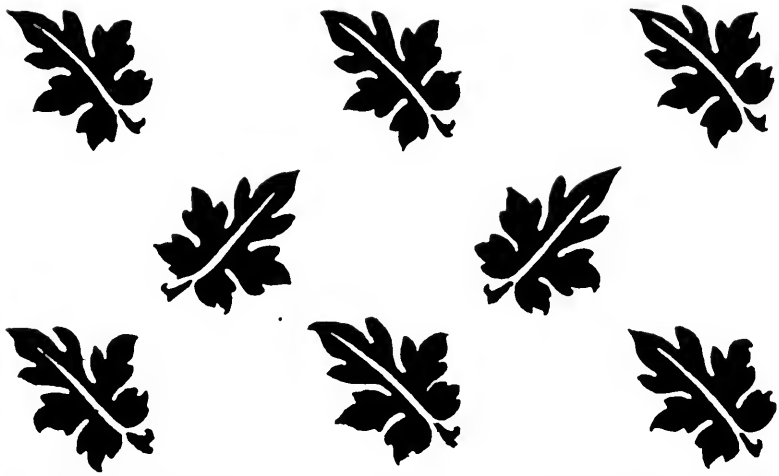


Fig 284



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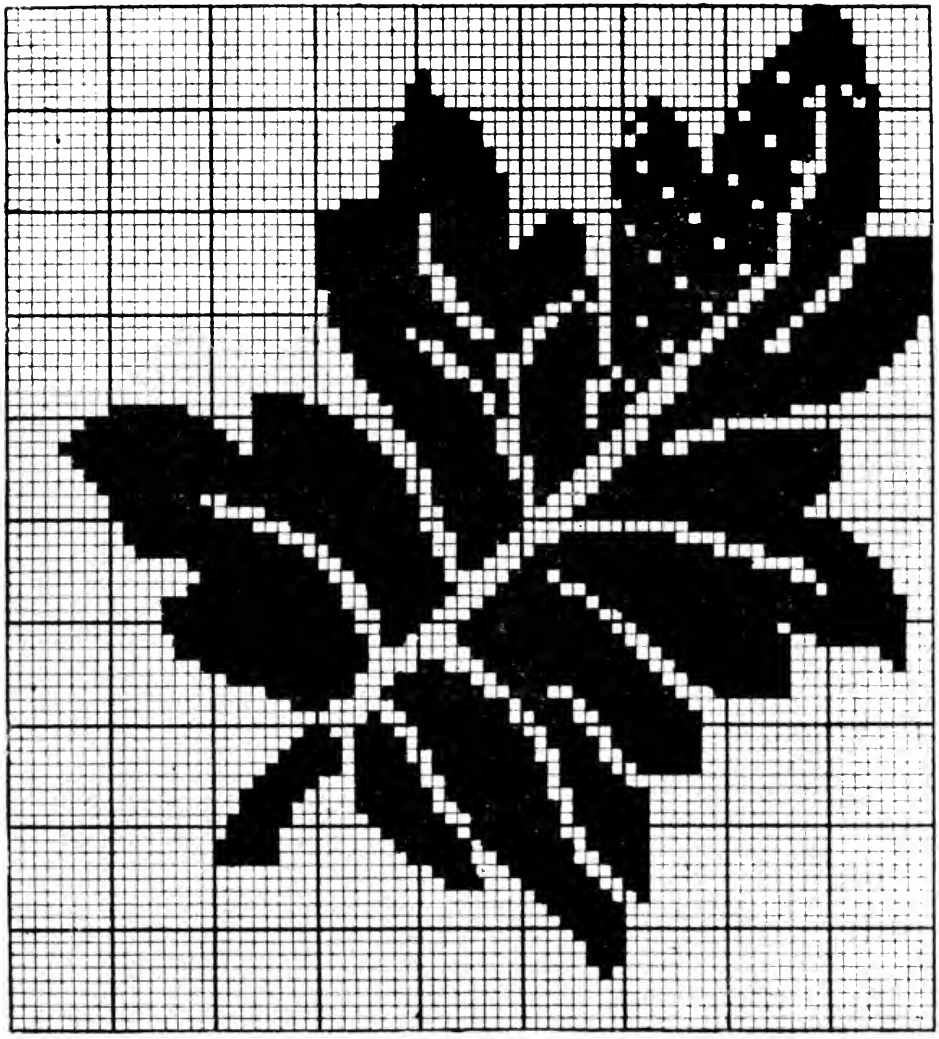

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